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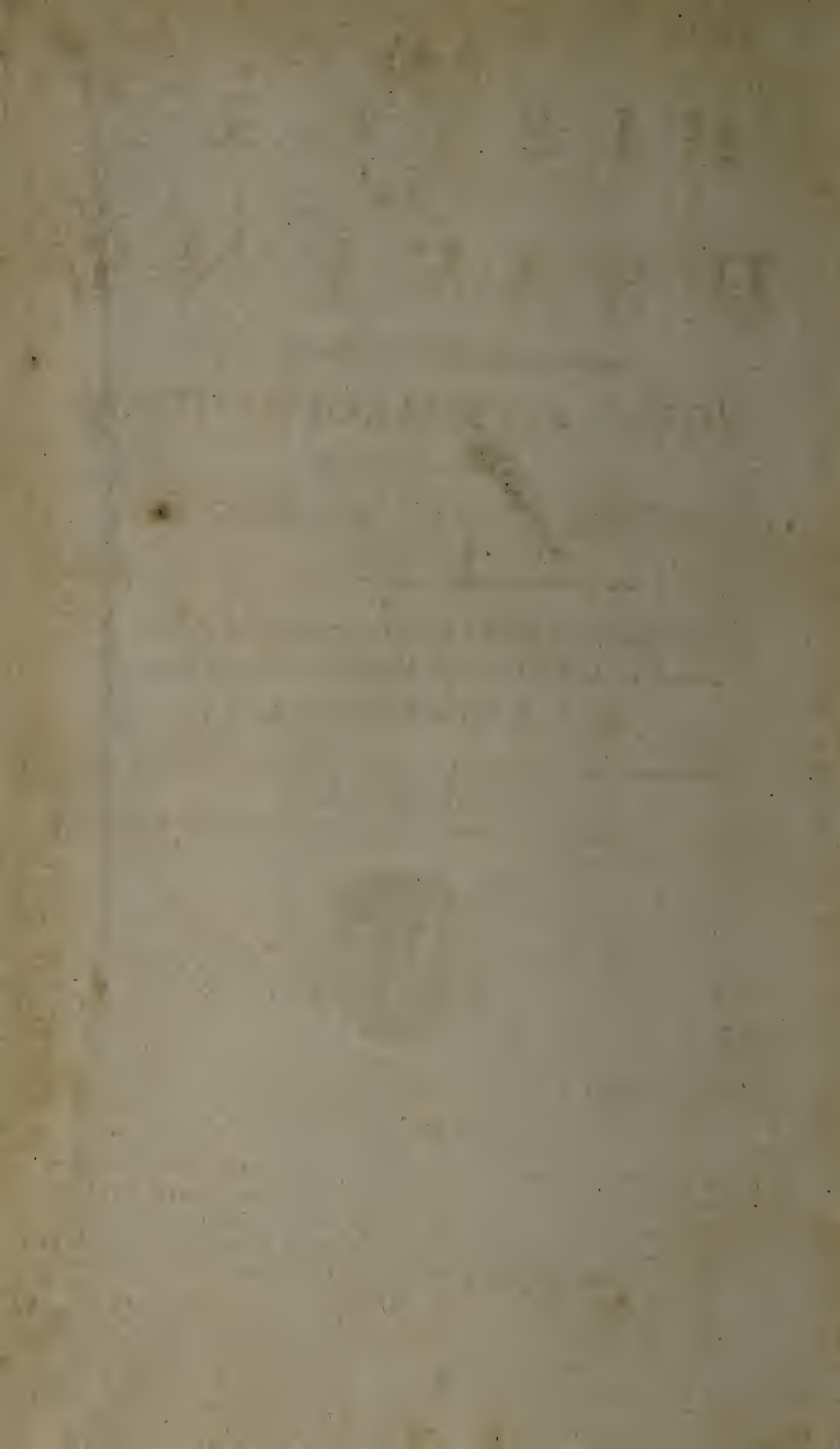
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THE
HISTORY
OF THE
HEAVENS,

Considered according to the NOTIONS of the
POETS and PHILOSOPHERS,
Compared with the
DOCTRINES of MOSES.

Translated from the FRENCH of the Abbé PLUCHE,
Author of the *Spectacle de la Nature*; or, *Nature Display'd*.

By J. B. DE FREVAL, Esq;

VOL. II.



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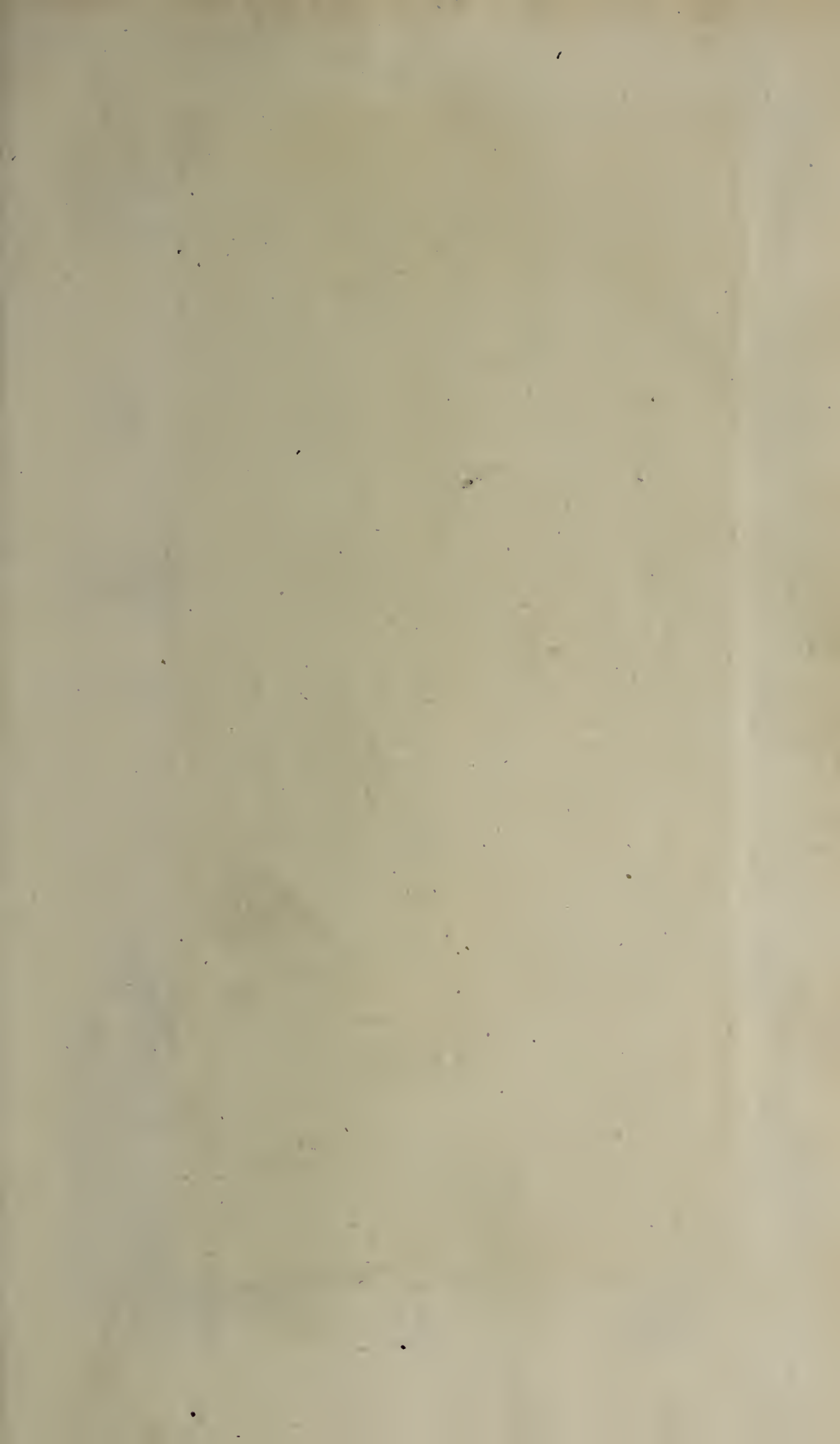
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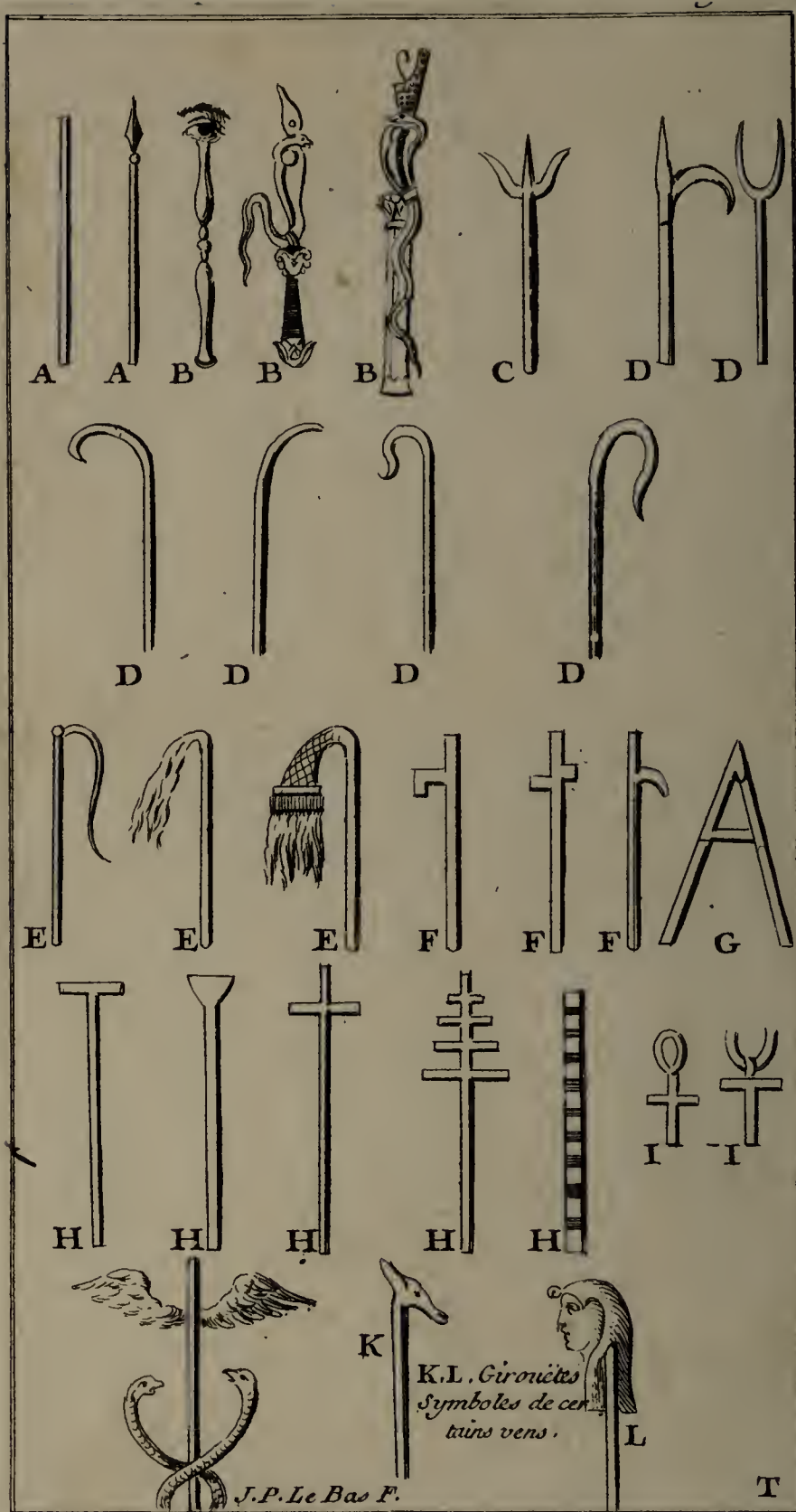
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A, Sceptre d'Osiris. B, autres Sceptres du même l'un surmonté d'un oeil; L'autre d'un Serpent et d'un bonnet royal. Le 3, du Serpent et d'un trône etc. C, Symbole de la Navigation. D, Aviron Symbole du passage. ou du trépas. D, Bâton pastoral. ou marque d'un gouvernem^t plein d'affection. E, Le fouët d'Osiris. F, La Clé d'Osiris. G, Equerre ou l'écriture courante pour marquer le P.^{er} Mois de l'Année. H, Mesures du Nil. I, Mesure abrégée.

THE
S E Q U E L
O F T H E
Poetical HEAVEN.

C H A P. III.

Divination.

ALL parts of the ancient writing were a DIVINA-
language, as they were significant. What TION.
was retained of these ancient characters
is this, *viz.* that they instructed men
with regard to all their wants: and the thing well
understood is perfectly true. But so soon as they
came to believe that stones, metals, elements, and
stars, were able to direct real discourses to men, or
capable of sending to them on purpose messengers
or advices concerning futurity; this gross mistake
filled society with darkness, puerilities, and super-
stitious practices.

After the principal figures of the astronomical and sacred writing, from the ignorance of their signification, had been converted into so many powers charged with the government of the several parts of the world, and mindful of instructing men in whatever was of concern to them; the additional figures that served to vary the significations of the keys of the writing, gave birth to new errors not less deplorable than idolatry itself. The birds, serpents, foliages, the sceptres or staves of honour, the crosses destined to measure the increases of the *Nile*, the curved staves surmounted with a head, or some out-jetting piece fit to take the wind, the flutes, lyres, sistra, and other musical instruments, that were the natural emblems of the feasts, and of the gratitude which is the soul of them; to these let us add the set-forms of expression made use of in the ceremonies and certain significant gestures prescribed by the ritual; the liquors, the salt, and the flesh of the victims, which were offerings inseparable from the religious assemblies, in short all the accessory parts of the figures taken for deities conversing with men, were interpreted in the same sense, and looked upon as so many marks by which these gods informed us of their intentions, and acquainted men with the success of their husbandry, their marriages, navigation, wars, and other undertakings.

But how was it possible, men will be apt to say, that the whole apparatus of religion has generally taken so strange a turn, and that the symbols or ceremonies which the people no longer understood the meaning of, were looked upon as so many tokens of future events? The answer is easy. This false interpretation of the additional figures, as well as that of the principal representations, was grounded upon what struck the eyes, and upon
the

the common sayings that were uttered on seeing these figures. It was by taking every thing literally, that almost all nations in general received the auguries, a persuasion of the planetary influences, the predictions of astrology, the operations of alchymy, the several kinds of divinations by serpents, birds, wands, and a multitude of others, in short magical incantments and conjurations. Thus the whole world was filled with extravagant opinions, which all men have not equally shaken off, and with the falshood of which it is of infinite service to be acquainted, since they are no less opposite to true piety, and to the ease and tranquillity of life, than to the progress of solid learning.

The reader here needs not fear lest I should refute these pretended sciences by exposing their principles, for indeed they have none. All their predictions and promises, even the most methodical, are nothing but illusion ; of which we may immediately be convinced by recalling them only to their original, which offers of its own accord. The birth of these extravagances, which have so long tyrannized over mankind, is an evident consequence of what we have proved in the foregoing chapters.

I.

The auguries.

H A S any of my readers been ever so little conversant in ancient history, he may remember to have often seen the Romans, the Sabines, the Hetrurians, the Greeks, and many other nations, very careful in never attempting any important undertaking, without previously consulting the birds, and drawing favourable or ill consequences

The origin and falsity of the auguries.

sometimes from the number and kind of the birds that traversed the air, sometimes from the side whence they began their flight, and the different course they took (*a*). We may likewise remember, that in order not to be obliged to wait long for a bird which chance might not immediately offer, the priests of the false deities had introduced the custom of the sacred chickens, brought into the middle of the assembly of the people in a cage, for the magistrates gravely to observe their awkward ways and motions. They had reduced into an art, and referred to constant and settled rules, all the consequences to be drawn with regard to futurity from the several methods in which these whimsical animals let fall or swallowed the food offered to them. Have not priests, either out of interested views, or from an infatuation for these chimerical rules, a thousand times spoiled or put a stop to the most important and best concerted undertakings, out of regard to the whim of a fowl that had refused her meat? Augustus and many other understanding persons have without any fatal consequences despised the chickens and divination. But when the generals in the times of the republic had miscarried in any enterprise, the priests and people cast the whole blame of it on the heedlessness with which the sacred chickens had been consulted, and more commonly still on the general's having preferred his own forecast to that of these fowls. Nor can one indeed, without some indignation see these dangerous sillinesses continue in the highest esteem and credit among people full of magnanimity, and the greatest genius seemingly making serious apologies for them.

(*a*) Livy may afford us sufficient proofs of this. See likewise Horat. Carm. lib. iii. od. 27.

Impios parræ recinentis omen ducit.

Tully has handed to us a good saying of Cato *, who declared, that one of the most surprising things to him was, how one soothsayer could look another in the face without laughing. And I don't doubt but this very judicious orator, when he was discharging his functions as a priest of the auguries, was always ready to change his countenance whenever he happened to see any of his colleagues walking with a grave stately air, and lifting up the augural staff to determine the spaces both of heaven and earth, beyond the compass of which the accidents in the air ceased to be prophetic. Tully was perfectly sensible of the vanity of these practices. After having observed in the second book of divination, that the Romans had never been concerned in a matter of greater consequence than that of the quarrel between Cæsar and Pompey, he freely confesses, that the augurs, aruspices, and oracles, had never been more frequently consulted ; but that the answers, whose number was endless, had not been followed by the events they foretold, or else had been succeeded by such as were quite contrary (a). However, Tully, notwithstanding this confession, which wholly demolishes the art of predictions, yet out of politick views defends the practice of it. He preferred the leaving the people in their error, to the risk of provoking them, in endeavouring to free them from a pernicious and a criminal superstition. After this it would be needless to pretend to explain, in what the art of the aruspices and that of the augurs consisted. It was no art at all. My reader understands what birds were in the symbolical writing, and I doubt not but he is ready to laugh on seeing the difference

DIVINATION.

* De nat. deor. l. 2.

(a) *Responſa innumerabilia quæ aut nullos habuerunt exitus, aut contrarios. Hoc civili bello dii*

immortales quàm multa iuſerunt !

of the birds which Italy consulted from those which served in ancient Egypt to give wholesome advices to the people. I own, that in after-times the inhabitants of Memphis, as well as those of Rome, very seriously examined the number, direction, arrival and departure of certain birds; that both at Memphis and Alexandria undertakings were regulated by the inspection of an African hen, as they were at Rome by that of an Italian chicken. But the birds, which the ancient priests of Egypt consulted, and which they had recommended to the people to examine with great attention, were birds only in their writing and speech. The hawk, whose return towards the south they so much desired, was not a hawk. The whoop, whose arrival and flying northward they expected, was no whoop. The Numidian hen, and the Ibis, which appeared in the publick signs, were neither a black stork, nor an African hen. These were the names and figures, or the signs of the dreaded or desired winds, not any birds in reality.

The Horus that bears a geometrical instrument, or a horn to denote publick works, or a long stick ending in a man's or bird's head, was husbandry, expecting one certain season or run of the air, favourable to surveying of land, sowing, or other works. The small switch he bears in his hand was sometimes quite another thing than a support or a staff of honour. The use of the vane or weather-cock is as ancient as the necessity of having recourse to it, and the sight of this instrument diversified according to the circumstances of countries and seasons, might be a perfect rule to the husbandman with regard to which wind he was to expect, and to the nature of the work which suited the season. But the same signs interpreted in a literal sense would afterwards be the occasion of nothing but

but ridiculous practices void of meaning. In vain did they in ceremony turn the curved end, or the outjetting part of the vane towards the south or the north ; that stick being no longer a vane to find out the course of the air, but a sacred instrument to mark out the points of the heaven, within the compass of which the passing of a bird had a good or bad signification ; the use of such a stick was surely fitter than any thing to discompose the gravity of those who handled it.

Anciently, or at the time of the institution of the symbols, men before imbarking, sowing, or planting, used to say ; *Let us first consult the birds.* Nor was any thing better understood. People were satisfied when they had observed this custom with care, and often reproached themselves with having neglected it, because these birds signified the winds, the observation and course of which determined the excellence of rural works, and the exactness or success of the precautions taken. But men, in process of time, very earnestly addressed to the birds themselves. The husbandman or the traveller, instead of attentively watching the blowing of the east, north, or southerly winds, the want of which was pointed out to him by the figures of Ibis, of hawks, or of whoops, in good earnest deferred his undertaking, till he saw the bird itself appear. The difference, the number, the course, the very minutest varieties of the flying of the feathered kind, became signs fore-running all events. Judge what advices could be obtained from prophets like these. The animals, the stars, and the birds, were not the only characters of the ancient writing. The other significant pieces, therefore, by degrees, acquired the reputation of giving advices not less useful than those which men fancied they received from the heaven, and the birds that traverse it.

DIVINATION.

The auspices: from *avispicium*, the inspection of the birds.

The POE-
TICAL
HEAVEN.

Liturg.

Divina-
tion by
the sticks.
ῥαβδου-
μαντεία.

saw in the hands of the figures of Osiris, Isis, Horus, and Mercury, sometimes a sceptre; sometimes a rush serving as a pen to write with; sometimes a horn to call the people together; sometimes a crooked stick, or a staff of honour, fit to denote a feast by raising an idea of him who presided over it with this mark of distinction; sometimes a vane to take the wind, a pole to measure the Nile, or a dry stalk, a reed, a distaff, to signify the support of the vine, the helps afforded by the loom, or some other works useful to mankind. All these very plain signs were at last no longer known. The only memory retained of them was, that they were signs, informations, and advices. This was most particularly affirmed of the magnificent staff which distinguished the president of the religious assemblies. Men took it into their heads, that the meeting of certain objects over-against these staves, after certain motions and ceremonies prescribed, were as many indications of what they wanted to know. But rhabdomancy, and the whole art of the auguries, both when men mistook a vane or a sceptre for a prophetic instrument, and when they lost sight of the figurative bird, thinking of a real one, could be nothing but a heap of frivolous practices. Without entering, therefore, into particulars concerning this business of the auguries, and of the signs of futurity, in which it were easy to tire the reader by a multiplicity of quotations, my having pointed out the origine of the two first kinds of divination, is sufficient to render them altogether ridiculous.

The constant sight of the symbolical birds, and the advice the priests gave to the people assembled as to regulating their whole conduct by the observation of these birds, having once spread abroad a persuasion that the animals which cross the air are
so

so many messengers sent us by the gods to inform us of their intentions, and to divert us from any disastrous undertaking, the people were extremely pleased with the thought of having gods wholly taken up with their concerns. They from a motive of cupidity took an affection for these familiar gods, which entered into their designs, informed them of every thing, and preserved them from all kind of misfortune, by giving them every moment new prognosticks concerning future events. Such deities as these were far more to their liking than a God searcher of hearts, who will be served with uprightness, and in spirit and truth. The desire of knowing futurity being thus authorized by the people, and by the common language, by the apparent sense of the ceremonies, and by a worship designed, as they imagined, to inform them how their undertakings would succeed, caused all the rest to be interpreted in the same sense.

DIVINA-
TION.

II.

Influence.

THE several phases of the moon, the marks of which were put with the foliages or flowers of each season over the head of Isis to proclaim the several feasts of the neomenia, the full moon, or the vane, accustomed them to look upon the moon as an affectionate power, which informed them of what they were to do or to deferr at certain times, and of whatever might forward or retard the productions of the earth. Isis or Juno, as a sign, in reality informed them of many very important things ; and because this figure gave them these advices, it is, that the Latins anciently called her *the Adviser*, *Moneta*. But when they once had

Origine of
the power
attributed
to the
moon.

had contracted a custom of taking this insign for a goddess dwelling in the heaven; intelligence, power, and the government of the earth, were attributed to her. Thus a simple kalendar, which could be no way hurtful, and the whole power of which was to *point out* the times of the assemblies, was converted into a source of influences which extended to every thing, and concerning which multitudes of people will at this day not suffer themselves to be disabused. If you will believe them, it is the moon who regulates the growing of our hair, the fulness of oysters and cray-fish, the success of all that is sowed and planted, the course of our diseases, and the effect of medicines. When they see the lead whiten, the stones scale, and steeples or pyramids sensibly inclining to the south-west, they might easily find the reason of these things in the perpetual vicissitude of the heat, the winds, and the great rains which come from that side, where these meteors nourish moss capable of scaling stones by the insinuation of its roots, and where they gradually mine the mortises, or the tenons of the timber-work. But prejudiced minds are much better pleased with the ancient language. With the moon they account for every thing. They explain every thing without being at the trouble of reasoning, or of understanding. And though you shew them that the light of this planet collected at the focus of a burning-glass cannot raise the liquor of a thermometer a hair's-breadth, they will confidently assure you, that it has the virtue of calcining lead, of preying upon wood, and of gnawing the very stones themselves.

III.

The Aruspicium.

Decency had from the most primitive times introduced a custom of never offering to the Lord in the assembly of the people any but fat and well-chosen victims. Their faults were closely examined, that the preference might be given to the most perfect. This attention which a ceremonial overstrained had made to degenerate into a trifling nicety, appeared an important practice expressly commanded by the gods. The choice of the finest victims was originally grounded on the reverence due to the sacrifice, and even on a respect justly paid to the assembly assisting at it. Men having once taken it into their heads that nothing was to be expected from the gods whenever the victim was not perfect, the choice and precautions as to this point were carried to an extravagance. Such a deity wanted white victims; another would have black ones; a third had an affection for red beasts.

Divina-
tion from
the inspec-
tion of
intrails.
σπλαγχι-
νομαντεία.

Nigram hyemi pecudem, zephyris felicibus albam.

These distinctions, which had their birth from the ancient significations assigned to the several dresses of Isis and Horus, being once established, the practice of them came to be attended with very nice scruples. Each victim underwent the strictest examination, and should any of those required to be of a perfect white have had a few black hairs, it had on this account been deprived of the honour of being sacrificed at the altar. The difficulty of finding beasts perfectly white or black puzzled them on many occasions, and especially when they wanted large

The POE-
TICAL
HEAVEN.

Bos cre-
tatus.

large victims. But they salved this inconvenience by blacking the white hairs of the black, and rubbing with chalk whatever place was of a dark colour in white heifers. Thus false piety seduces and imposes on itself by a scrupulous attention in whitening the outside.

Men having immolated the choicest victims, yet thought themselves not sufficiently acquitted. They viewed their intrails, which they removed in order to dress the flesh ; and thought they had done nothing, whenever any part happened to be vitiated; impaired, or distempered. But when the whole was found, and the intrails as well as the outside were without defect, they believed the gods were satisfied *, and all the duties compleatly fulfilled, because nothing was wanting to the ceremonial. Under an assurance that they had thus engaged the gods in their interests, they imbarqued or went to fight: they did every thing under a full persuasion of succeeding, and this confidence was more capable of procuring them an happy issue, than the protection of their imaginary deities.

This soundness of the in and outward parts of the victims being made the sure means of knowing whether the gods were satisfied, it became, as in the auguries, the greatest business of ministers. These silly rubric-makers made perfection wholly to consist in an exact knowledge of the rules which fixed the choice and general examination of the victims. Their great principle was, that the perfect or defective state of the outward parts and intrails was the mark of the consent, or express opposition of the gods. Accordingly, all became matter of observation, all appeared to them significant and important, as well in the victims about to be sacrifices, as in the birds that traversed the sky. All the motions of an ox led to the altar became

so many prophecies. When he advanced with an easy air, in a strait line, and without offering resistance, it was the prognostick of an easy and flowing success. His untowardness, his windings, his way of falling or of struggling, occasioned so many favourable or sinister interpretations. They procured credit to the whole as well as they could, by frivolous resemblances, and by mere punctilio's and trifling niceties.

The art of the augurs and aruspices obtained credit, because it was a common thing to see undertakings succeed, after the priests had given the usual assurances that the sacrifice was duly made, and the gods satisfied. If after the appearance of a compleat favour from the god to whom they had addressed, the affair happened to miscarry, the whole fault was shuffled off to some deity more difficult to be pleased. Juno or Diana had been neglected, and the whole remedy consisted in repeating the sacrifices with more precaution, not to have these jealous gods against one. The art of foretelling was not a whit less sure for having once prognosticated a falsity. The only inconvenience was to begin afresh, which the ministers were still gainers by.

IV.

Divination by Serpents.

WE find prognosticks of futurity, and doubtless as certain as the former in all other parts of the outward worship. The serpent, that symbol of life and health, so very common in sacred figures, so often making a piece of Isis's head-dress, always twisted round Mercury's and Esculapius's wand, inseparable from the small chest, which contained the

Divination by serpents.
ὄφιομαντεία.

The POE-
TICAL
HEAVEN.

Æneid. 9.

Ibid. 2.

Divina-
tion by the
cock.
ἀλεκτρο-
μαντεία.

the mysteries, and constantly introduced into the ceremonial, became one of the great means of knowing the will of the gods. The folds and motions of serpents were religiously observed. Anchises becoming a god, thinks he cannot better testify to his son how well he is pleased with his piety and sacrifices, than by sending a huge serpent, which tastes the funeral offerings, and then retires into his tomb. A couple of serpents proclaim the displeasure of Minerva before Troy, and then retire under the cask of this goddess after the death of Laocoon. So great faith was given to serpents and their prophecies, that some were fed on purpose for this use ; and men, by rendering them tame and familiar, had prophecies and predictions always at hand. A number of experiments made for many years passed by our apothecaries, and by the major part of our botanists, who have frequent occasions to make this trial in gathering their physical herbs, have taught us that snakes have no teeth, no sting, nor any venom. The boldness with which the diviners and the idolatrous priests handled these animals was founded on the trial made of their want of power to do mischief. But this security however imposed upon the people, and a minister who handled the snake without being hurt, had no doubt a correspondence with the gods.

The cock commonly placed by the side of Horus and Anubis or Mercury, very plainly signified what was to be done in the morning, as the owl marked out the assemblies that were to be held in the evening. Cocks and cockrels were then made, so many new monitors foretelling futurity ; and the owl acquired in this matter a talent which many people earnestly contend she is still possessed of. When this bird, which is an enemy to light, happens to shriek as she passes by the windows of a sick person,

person, where she perceives it, you never can beat it out of their head, that this shrieking, which has no manner of relation to the condition of the dying man, is a foreboding of his end.

DIVINATION.

The shooting of flames, the crackling of salt, and the blazing of liquors, or of flour thrown into the fire on the altars, made other kinds of distinct divinations. But the capacity of the human understanding not being equal to so many profound sciences, the priests pretended not to know them all. They divided among themselves these noble studies, and each of them drew as much profit as he well could from his particular merit.

Divination by the fire.

πυρομαντεία.

* The leaves, such as those of the banane-tree, the lotus, the colchas, the persea, and a multitude of others, one of which marked out the divine fruitfulness, another one part of the day, as for instance, the rising of the sun, a third such or such portion of the year, or some other particular (which I neither must nor am willing to explain) as well as the animals, came at length to be revered and consulted.

* Divination by the plants

βοτανομαντεία.

V.

Incantments.

THE putting together of several foliages skillfully combined to vary the significations, made men think that such or such a conjunction of plants, even without being made use of as a remedy, was of great efficacy to procure health ; and men seeing no manner of connection between a few slips of grafs disposed in such or such a manner, and the cure or the plentiful harvest which they fancied would result from them, they could contrive no better a come-off than that of placing the principal virtue

Witchcrafts and incantments.

φαρμακεία.

The POE-
TICAL
HEAVEN.

virtue of these things, in the concurrence of the obsolete and unintelligible words, which the priests pronounced or sung as they carried these symbols in pomp before the people. The thing was very plain. Both these foliages and the set-forms intimated to the people some truth, feast, or operation, which was to be general and uniform. Understanding no longer the symbol nor the set-form which they still religiously preserved, they mistook the union of certain plants with some few words, for so many mysterious practices tried by their fathers, and which were punctually to be observed, lest all should be lost. Of these they made a collection, and an art, by which they pretended to provide almost infallibly for all their necessities. The uniting such or such an ancient set-form with such foliages ranged upon the head of Isis round a crescent or a star, introduced the extravagant opinion, that with certain herbs and certain words the moon and stars might be called from the heaven down upon earth.

Carmina vel possunt cælo deducere lunam.

They had set-forms for every case, even to hurt their enemies (a). The knowledge of several wholesome or mischievous simples came in to the assistance of these invocations and curses, void for certain of all power ; and the successes of medicines, and of the art of poisons, promoted the credit and vogue of the chimæra's in the science magick.

But humanity inspiring men with a natural horror for such practices as tend to the destruction of our fellow-creatures, the magick incantations which

(a) See the idyls of Theocritus ; Virgil's eclogue, intitled *Pharmaceutria* ; several

epodes of Horace, and the fourth book of the *Æneid*.

were

were deemed as murderous, were abhorred and punished by all regular nations (b). Therefore the whole sum of the current religion was in a manner reduced to procuring one's self, by the worship of such or such god, either remedies in an illness, or some predictions of futurity in the uncertainty of affairs.

DIVINA-
TION.

VI.

Astrology.

THIS seemingly lawful desire of certainly procuring one's self remedies, and of penetrating into futurity by the help of a few religious practices, gave birth to an art every whit as deceitful as the foregoing, I mean that of astrology. I might here quote a croud of horoscopes and predictions of astrologers fully contradicted by the event (c). Let us however treat astrology as we did idolatry, the auguries, and magick. Let us see it in its birth. The history of the origine of this pretended science is the refutation of it; since the whole of astrology in its rise is still nothing but a false interpretation of a few signs taken in a wrong sense.

The ori-
gine of ju-
dicial a-
strology.

The Egyptians had insensibly and by degrees looked upon the names of the zodiacal signs, and of many others, as memorials of what had happened to their founder, to their common mother, and to other heroes of their country. The history

(b) *Testor, carā, Deos, & te, germana, tuumque
Dulce caput, magitas invitam accingiet artes.*

Æneid. 4.

(c) See the falshood of the horoscope of Mr. Suffren, drawn and signed by Nostradamus; and of the predictions made by

J. B. Morin to Mr. Gassendi
*Vie de Gassendi chez Jacques Vin-
cent rue S. Severin 1736.*

of these assumed another form in other places. The worship of the great king, the queen, and the heavenly host, had indeed passed from Egypt into Phœnicia, thence into Arabia, Assyria, and almost every-where else ; but with the luggage of the figures, all nations did not equally admit of the absurd tenet of the metempsychosis, much less the pretended histories of the Egyptian gods, which were of no concern to other people. Nations were generally contented with honouring the sun as the great mover of nature. The moon had the second rank in the class of powers ; then each sign and constellation had its proper district and measure of influence assigned it. But what function shall the ram, the lion, and the balance, obtain in the heaven ? Why, men imagined that their names were indications of their several offices, and specifications of their influences. The ram therefore had a strong influence over the young of the flocks. The balance could inspire nothing but inclinations to good order and justice. The scorpion was fit to excite none but mischievous dispositions. Each sign in short caused the good or the evil intimated by its name.

But on whom are these influences to fall ? Shall they turn and set every thing topsy-turvy upon earth ? This was provided against. A speculative and systematick genius conceived that the critical moment for the exercise of the power of each sign was that at which it ascended the horizon, and that the child born at that self-same instant was he who found the strongest impressions from it. Thence, by an argument, which, silly as it was, made a speedy progress, our philosopher concluded that the child who came into the world at the exact instant when the first star of the ram ascended the horizon, would infallibly be rich in cattle, and so
of

of the rest. This was a sorry abuse of the emblematic relation which is between the sun under this constellation, and the beginning of the spring in which the lambs come to be saleable, and of advantage to their masters. This was a way of arguing nearly like that of a man, who should imagine; that in order to have good wine in his cellar, it would be enough to hang a cork at his door, and who should mistake for the cause of a thing what would be only the mark and sign of it.

They ran into the same extravagance as to the power of the bull and the kids. They understood (pray admire the conceit) that the enterprises of him who should come into the world under the sign cancer, should always go backwards and downwards. The lion was to inspire courage, and produce heroes, or if you will quarrelsome fellows. The aspect of the virgin carrying the celestial ear of corn, was to inspire chastity, and to unite virtue and abundance. Happy the people whose king should be born under the sign libra. Vengeance to all that should light under the horrid sign of the scorpion (a). The fortune of him who was born under Capricorn, and especially when the sun ascended the horizon, together with that sign, was always to get upwards like this animal and the sun, which then ascends for six months together. All these little trifling subtilties were often contradicted by quite contrary events. But people in this case insisted much upon the conformity of several other events with the prediction, and they found means to get out of the briars, and avoid contradictions, by alledging the concurrence of the moon, the other planets, and the stars, which by either their op-

(a) *me scorpius aspicit*

Formidolosus, pars violentior

Natalis hora. Horat. Carm. l. 2. od. 17.

position or conjunction, as it were, blunted the goodness of certain influences, and mitigated the malignity of others (a). The nicest point of the art was to know how to combine these situations ; to observe whether the influences proceeded in parallel lines ; whether the fall of some was oblique and perpendicular upon the others. They must have known how to measure portions of circles, how to calculate angles by the tangents and signs, and study the œconomy of the heavens, in order to know the diversity of the aspects. The astrologer took a pride in a mere outside of learning. Geometry and astronomy, the finest of sciences, thus served to introduce into the world all the insipidities of astrology. Nor is it useless here to observe, that a system, which more than any pretends to be connected with astronomy and geometry, may very well prove a mere learned chimæra.

Those who might be curious of knowing how far astrologers have carried the absurdity of their arguments, may satisfy themselves in casting their eyes upon the poem of Manilius, or upon the little book of Cenforinus *de die natali*, or upon the *astro-nomicks* attributed to Julius Firmicus. I chuse to refer my reader to, rather than quote any single passage of them. The ravings of a delirious man are more coherent than the principles they lay down, and the consequences they draw from them.

But the greatest of the evils caused by astrology is, not only to feed mens minds with frivolous promises, trifling operations and influences void of reality. The error was itself great indeed : but it had consequences still more dismal. The celestial signs

(a) : Te Jovis impio
Tutela Saturno refulgens.
Eripuit, volucrisque fati
Tardavit alas. Horat. *ibid.*

or the points of the heaven designed to mark by a certain denomination certain effects proper to each season, were no sooner taken for the causes of these effects, but this pitiful mistake obtained credit; because men fancied they found the reasons of every thing therein, and an infallible means of avoiding the evils they were threatened with. They pitched upon such a month, day, hour, and aspect, to begin a voyage, a ploughing, a piece of stuff. They forbore doing any thing, till they should be under a favourable point: The ascendant (*a*) point of such a star produced this, and the culminant (*b*) point of the same or of another star corrected that. Men were no longer employed about any thing but studying with anxiety the decisive seasons, days, and critical moments. Astrology in some sense did more mischief than idolatry itself. The latter, criminal as it was, yet permitted some remains of gratitude for favours received, and of a religious awe for the infinitely just who punishes wicked actions, to subsist in minds seduced with regard to the object of their worship: But astrology completed the ruin of every virtue. To prudence, to experience, and wise precautions, it substituted superstitious set-form and puerile practice. It enervated mens courage by apprehensions grounded on a few puns and quibbles. It abolished the practice of virtue almost every-where, and quieted criminal minds, by making them cast, upon the unavoidable impression of the predominant planet, the evil which was but the result of their natural depravation: And this dismal facility of quieting and lulling the conscience asleep, doubtless is the secret reason why ambitious and voluptuous men, while they are altogether insensible of the

(*a*) Arriving at the horizon, or at the highest point of its

(*b*) Arriving at the Zenith, course in our hemisphere.

beauty of the gospel, and the multitude of proofs which support it, yet receive with a blind credulity the predictions of astrology, and the arguments that are most destitute of probability. Irreligion was hardly carried to a greater degree any-where than at the court of Henry II. and that of Henry III. Never were astrologers better paid : never horoscopes in greater vogue than at that time. This disease of predictions was likewise contagious under Henry IV. and Lewis XIII. De Thou, Mezerai, and many other very judicious genius's had from their infancy been infected with this evil ; nor were they ever thoroughly cured of it.

VII.

The power of the planets.

THERE is nothing so often repeated in the whole art of astrology as the power of the planets. The benign influences of the moon in conjunction with the planet Jupiter, and its malignity when in conjunction with Saturn, are always produced. Each situation has its own privileges, and must be sought for or avoided with particular precautions. But here are two observations which considerably disconcert the astrologick system. First, the virtues proper to each planet are founded on the characters of the heroes, or the gods lodged in them. Secondly, these gods and heroes are fabulous, and never existed. If both these points may be proved, it will be with the virtues of the planets, as with the heroes who sojourn there, and the whole will prove a fable.

I. The first point wants no proofs. Every one is sensible, that languid inclinations, or even destruc-
tive

ive influences, have been attributed to the planet DIVINA-
called Saturn, upon no other account than that men TION.
have bethought themselves of lodging Saturn with
his gray hairs therein, and of representing him with
a scythe to destroy every thing.

The distribution of sceptres and grandeurs, the
prolonging of life, and the most desirèable influ-
ences, have been ascribed to the planet named Ju-
piter, for no other reason but because men, with-
out any foundation or reasonable motive, have
thought proper to give this planet the name of the
father of life, which name used to be represented
by a sceptre accompanied with the heva or serpent
the symbol of life.

The planet called Mars inspires men with a
strong inclination for war, because it has been made
the abode of a pretended warrior called Mars, and
the expression of it has been abridged by the figure
of an arrow or a dart.

Why has the planet Venus the reputation of ren-
dering men either voluptuous or happy, if not,
because it has received the name of the pretended
mother of pleasures, and is represented by a Ty-
phon, or the character of evil chained up ?

Men would never have thought of attributing
the superintendency of commerce, and the prosper-
ity of republicks, to the other planet, which is al-
most always invisible, and immersed in the rays of
the sun, had not men out of caprice and for no
reason given it the name of Mercury, the pre-
tended inventor of polity, and were not the god
and his habitation characterised by a Typhon
chained up, and accompanied with two serpents,
an ingenious symbol of life and of society.

All the virtues of the planets have then their
origine from the character of the gods who were set-
tled there. And as the nature of the animals, of

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which the twelve houses of the sun bear the names, raised in mens minds the thought of such or such an impression under the aspect of each of these signs, the characters of the gods and goddesses, that gave their names to the planets, in like manner determined the virtue of these planets.

II. Now, what are these gods authors of so many influences and powerful impressions? Even figures whose whole power is to denote and signify. They are mere names, whose whole virtue is to advertise. They are the letters of an ancient alphabet, which every nation, for want of having preserved their meaning, has converted into so many histories full of absurdity.

If you believe astrologers, nothing increases the power of the planets more than the concurrence of their ascension with that of a favourable sign. For then is formed a parallelism of benign influences which march in company, and which fall together on the happy head that moment born. Could ever any thing be imagined more arbitrary and opposite to experience, which shews us events and characters diametrically opposite, in such persons as had the self-same aspect of the stars in their birth?

But what completes the ridicule is, that what astronomers call the first degree of the ram, the balance, or sagittary, is no longer the first star of the sign which communicates fruitfulness to the flocks, inspires men with justice, or makes them heroes. Men have found in a long train of ages, that all the celestial signs had by little and little receded from the point of the vernal equinox, and had drawn back to the east. Notwithstanding this alteration, the point of the zodiack that cuts the equator is still called the first degree of the ram, though the first star of the ram be indeed thirty de-
grees

degrees beyond it. All the other signs are put back in the same proportion, and all the points of the heaven mentioned in nativities are thirty degrees on one side the stars, of which they bear the names. When it was said to such a one that he was born under the first degree of the ram ascending, it was in reality the first degree of pisces, which at the time came above the horizon. When another is said to be born with a soul intirely royal, and with heroic inclinations, because the instant of his birth the planet Jupiter ascended the horizon in conjunction with the first star of Sagittary, Jupiter at that time was indeed in conjunction with a star removed thirty degrees eastward from Sagittary ; and in good truth it is the pernicious scorpion which presided at the birth of this incomparable child.

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VIII.

The origine of the week.

THE enemies of revelation feel a secret pleasure in seeing that the days of our week still bear the names which paganism has given the seven planets. They would fain make the world believe, that the whole religion of the Hebrews, and even ours, are so many extracts of the Egyptian religion. But thinking thus is indeed being very little acquainted with the human heart. It is going against all the rules of common sense, and the testimonies of experience. If you believe those to whom revelation is a burden, the first men should from the beginning have had a religion altogether monstrous, and clogged with a multitude of extravagant opinions, senseless ceremonies, and mysteries full of absurdity ; after which this prodigious heap of superstitions should by degrees have been

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* Galat.
3. 23, &
24.

been laid aside, to form a system of religion more simple, and confined to a very small number of duties and objects. This progression is not indeed in nature, Every-where and in every thing men begin with what is simple; and this afterwards grows more compound, is disfigured and altered by additions, imbroideries, and commentaries. What is the bottom of our religion? If you except the more express profession of expecting our salvation from the merits and mediation of our Saviour, our religion is the same with that of Noah and his children. The same God, the same sentiments, the same duties, the same hopes. The decalogue of Moses, which is also ours, has preserved this religion in its purity. Moses added nothing to it, but a ceremonial of œconomy, fit to restrain the people with whom the promises were deposited, and to divert them from idolatry, till the times of grace*, by a body of transitory regulations, which fixed every particular of their worship, food, and polity. But the Egyptians, and after them all the nations of the earth, having received and retained the first grounds of the ancient religion, which consisted in honouring the author of all good, in meeting together to praise him in common, and in doing honour to the dead, have at length most horridly disfigured this majestick simplicity, by incessantly clogging their creed with false opinions, and the ceremonial with superstitious practices. We then follow nature and experience, when we go back again from the composed to the simple, by confidently affirming, that common prayers, sacrifices, funeral honours, and the hopes of another life to come, which are found again in Egypt, but blended with so many extravagant fancies, are nothing but the ancient religion lost in the croud of subsequent additions. And if the Egyptians, notwithstanding

withstanding the enormous multiplicity of their ^{DIVINA-}ridiculous tenets, do yet concur with us in the usage ^{TION.} of feasts, in the expectation of a better life to come, and in the honours paid to the dead, it is not that we have received from them these articles, and purged them of the follies they had blended them with, but because we all of us here on earth, Egyptians, Heathens, Jews and Christians, have retained the primitive grounds of the religion of Noah. The source is common. The water that springs from it, and through different channels, runs among our neighbours as well as ourselves, is pure with us, and horridly muddy and corrupt among our neighbours. Would it be arguing reasonably to say, it was from our neighbours we received our water; we only took care to purify it? No, sure. But if ours is pure, it is because we receive it immediately from the first fountain. Neither the Hebrews nor we have received any thing from Egypt. But he who had been promised to the Hebrew people, is also become the light of the Gentiles. *Dedi te in fœdus populi; in lucem Gentium* *. He * *Isai. 24.* has in us preserved the little portion of good which remained therein. He has neither totally crushed the broken reed, nor extinguished the smoking snuff. Far from it. What he had promised above two thousand years ago to all nations, and especially the inhabitants of Europe, *legem ejus insulæ expectabunt* (a), he has faithfully accomplished; *Ibid.* 1. By destroying idolatry; 2. By recalling us to the ancient religion of our forefathers; 3. By besides giving us a new revelation; 1. *Gloriam meam alteri non dabo, & laudem meam Sculptilibus.* 2. *Quæ prima fuerunt, ecce venerunt.* 3. *Nova quoque annuncio.*

(a) The islands in the style of the scripture constantly signify Europe.

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The order of the week, and the repose of one day every week, far from being an imitation of the distribution of the days made by the Heathens in the honour of the seven planets, are also an usage of the most ancient religion : I dare say, even an usage as ancient as the world itself. 'Tis true, the testimony of Moses, who assures us of it, is not sufficient to such as set up their own private little reason for an infallible judge of every thing. But it is at least an easy matter for us to shew them, that Moses without the least interest assures us, that the sanctification of the seventh day is of as ancient a date as the earth itself, and that he had commanded the exact celebration of every seventh day among the Hebrews, long before the Heathens had given the planets and the days of the week the names they still bear among us. Whence it follows, that neither the sabbatical week of the Hebrews, nor that of the Christians, which is the same, is to be looked upon as an imitation of the planetary week of the Heathens, which is posterior to the former.* The Romans knew but very late the order of the week, and the worship of the seven planets. They had in every month three distinct days, *viz.* the Kalends, the Nones, and the Ides. The Kalends, or the convening of the neomenia, fell on the first day of the month. The Nones fell on the fifth, except in the months of March, May, July and October, in which they fell on the seventh. The Ides fell on the thirteenth, except in the said months, in which they fell on the fifteenth. All the other days were calculated according to their degree of remoteness with regard to the Nones, the Ides, or the Kalends, which were immediately to follow.

* The kalendar of the Romans without a week.

Kalendars of the Greeks without a week.

The Athenians, even after the reforming of their kalendar by Methon, had still a custom of calculating

calculating their first month in fixing the beginning of the year at the summer-solstice, which custom they had from the Egyptians their forefathers. DIVINATION.

• • • *Primæva Meton exordia sumsit ab anno,
Torreret rutilo Phæbus cum sidere cancrum.*
Festus Avienus.

But the Greeks, who had this usage from Egypt, would infallibly have stuck to the division of the week, and the important practice of honouring upon each day a certain particular planet, had Egypt known this custom of old. Now, the Athenians, though originally from Sais, and most of the Greeks, who, according to Isocrates *, had received from the Athenians the form of their religion, and of their principal practices, instead of calculating the months by weeks, divided them into three decads, which they called the month *beginning*, the *middle* month, and the month *finishing*. Each day was afterwards calculated according to the rank it had in the decad. * In Panegyrico.

To these evident proofs of the newness of the worship of planets, let us add another drawn from the newness itself of the gods honoured in them, and above all from the newness of the time when men began to lodge them in the planets.

Saturn, Jupiter, Mars, Venus, and Mercury, are indeed gods invented on occasion, and in imitation of those of Egypt. The Egyptian symbols having been carried from one country to another, each nation explained them after their own manner, and mistook them for heroes of their own country. Thus Osiris became Marnas in Palestine, Moloch among the Ammonites, Baal in Syria, Jupiter in Greece ; and of a single sign, variously presented, several gods were formed. But

But it was long after the birth of these new gods that men bethought themselves of assigning them places in the planets. Having given them a reasonable time for being hatched, they must be allowed a certain space to be known in. It was in a length of time only that their worship could be established, illustrated, and pass from one country to another, in order to their being known, and to have holydays celebrated in their honour everywhere.

The Greek Jupiter was originally the same as Osiris : but he had acquired in Greece other names, new dresses, another genealogy, and quite another history. Besides, he made a greater noise in the world than the Egyptian Osiris; whose worship was confined to the countries adjacent to the Nile. The eastern Venus was the same with Isis in her origin : but a new name and new functions had rendered her another divinity more generally known than Isis. The Marcol or Mercury of the Chanaanites, in good truth was nothing but Anubis or the dog-star : But he obtained such vast credit under the form of the god of commerce, that the barker with his dog's head appeared a ridiculous deity in comparison of him. There are then six gods instead of three. The Egyptians and eastern nations were at a loss how to find a place for these gods, whom they could not with any decency refuse an entrance into their temples. Osiris was in possession of the sun. The throne was filled. Isis had the moon for her appointment; and Anubis had ever lodged in the dog-star.

What shall they do to satisfy Jupiter, Mars, Mercury, and such other gods, who, modern as they were, yet were of some importance, as being preached up by powerful nations, and celebrated by famous poets? Those who inhabit the sun, the moon,

moon, and the constellations, to be sure must not be turned out to make room for them. But those new-comers may be introduced into the planets, which being vacant posts, may be a means to make every one satisfied with his own condition. Thus it is that Saturn, Jupiter, Mars, Venus and Mercury, in process of time, increased the heavenly host. But it was very late, and long after the Greek and Latin mythology had been introduced, that men thought of determining the districts of our five newly-coined divinities, by assigning to them the five small planets for their dwelling places.

All this distribution being still of later date than these five deities, which were themselves much posterior to the rise of the Egyptian gods, it is no wonder that men have totally deviated from the ancient use of the symbols, by using in the astrological writing a circle to denote the sun, and a crescent to denote the moon. In the primitive use of these figures, the circle or the sun did not signify the sun, but God. It was the enigma or emblem of him; nor does the word circle in its origine signify any thing but the enigma *par excellence*. The figure of a crescent did not signify the moon, but the neomenia, the convening on the first day of the month. In like manner the T put under the planet Venus, and the caduceus given to Mercury, in their origine were nothing but the measure of the swelling of the Nile, or a warning to be aware of it. But here these two attributes are taken, one for the mark of a celestial embassador, the other for evil chained up; imaginary significations of later ages, and altogether remote from the visible purport of the symbols. All then concurs to shew us, how modern the worship of the planets is, and that the sabbatical week was considerably prior to it.

The reveries of judicial astronomy, and the nativities drawn from the aspect of the planets, were, 'tis true, in use among the Egyptians in the time of Herodotus: but this period is a thousand years posterior to that of Moses. What may be inferred from the testimony of Herodotus and some others, is, that the Egyptian nation being constant in their practices notwithstanding the oddness of the interpretations they gave them, there is some reason to believe, that the Egyptians of the remotest antiquity reckoned their days by sevens. But whence have they this custom? are they indebted for it to the Hebrews, or have the Hebrews received it from them? Both these are equally false.

The Egyptians having retained the primitive usages of the remotest antiquity more constantly than other heathen nations, it thence happened (and that without any design on their part) that they regulated their astronomy and the order of their days in reckoning them by sevens, as was done in the time of Noah, and even of Adam himself. They observed a custom, for which they knew no reason. They afterwards perverted it, in pretending, as did all other nations, to find the reason of this number seven in the number of the planets, which happening to be the same, appeared to them to have relation to the order of the week, though these things were connected one with another by a mere imaginary thread.

Here again let us go back from the composed to the simple. It is the order of nature. The Egyptians, and perhaps many other eastern nations, reckoned, I own, the series of their days by the number seven incessantly repeated. Let us here lay aside the extravagant notions which their doctors added to this practice, in order to account for it. The more extravagant things they have said

er done with relation to this practice, as they have with many others, the more they make it appear that the explications are the work of people who understand nothing of the matter; and that the practice considered in itself has been handed down to them from a higher source.

Here again it is that fable does homage to truth, and that Moses alone supplies us with the true unravelling or primitive reason of this number seven used among the Egyptians, the Hebrews, the Heathens, and the Christians.

While all nations were going astray, and worshipped dead men, the sun, the heaven, or the world itself as an eternal God, the people with whom the promises had been deposited, received directions for reviving the ancient method of reckoning the days, and for sanctifying the seventh day of each week, both in forbearing manual works, and in the consideration of the works of God; because this method of reckoning the days, and of employing them, was an express profession of the creation of the heaven, the earth, the sun, in short of all nature, and was at the same time the most publick condemnation of the polytheism * of the * Plurality nations. *Six days shalt thou labour, says the Lord to them, and do all that thou hast to do: but the seventh day is the sabbath of the Lord thy God. In it thou shalt do no manner of work; for in six days the Lord made heaven and earth, the sea, and all that in them is, and has on the seventh day ceased to produce new beings; wherefore the Lord blessed the seventh day, and hallowed it, or reserved it to himself.*

What a prudence, and at the same time what dignity in this polity, which distinguishes (a) the people of God from all others; which binds them in a special manner to God; which incessantly refers them to the true origine of all things, and by the renewed me-

(a) *Signum inter me & vos.* Exod. 31. 13.

morial of the work of six days, and of the consecration of the seventh, guards them against the errors of the idolaters, who adore the creature; against the errors of atheists, who refuse to acknowledge the Creator; and against the errors of deists, who prefer the uncertainty of their own arguments to the lights of the primitive revelation!

IX.

The origine and falsehood of the sibyls.

AGAIN, it is from a sensible abuse of astronomy or of the custom of consulting certain stars, that the oracles of the sibyls were introduced. Harvest has always been the great object of the desires and attention of all nations. In order therefore to regulate the manuring of their lands, their ploughing, sowing, and the other operations of concern to the bulk of society, men had their eyes fixed on the virgin that bears the ear of corn, and which is the mark of the time of harvest. They observed how far the sun was remote from it, and on this account they generally used to say that they must consult and have recourse to the virgin; a language as reasonable as the practice expressed by it. They at first gave this constellation the name of Shibyl Ergona (*a*) *the reddening ear of corn*, because it is exactly the circumstance for which men wait to begin their harvest, and because their crop ripens when the sun draws near this collection of stars.

They afterwards called it sometimes Sibyl, sometimes Erigone. This name Erigone rendered in Greek by that of Erythra, which corresponds to it, and signifies *red*, gave birth to the Erythrean sibyl. There was certainly an advantage in consulting her, and her

(a) From שִׁבּוּל *Shibul*, or *ne, purpura*. The purple ear of שִׁבּוּלֵת *Shibbolet*, *spice*; and corn, *spica rubescens*.
from אֶרְגוֹנָה *Dan. 5. 7. Ergo*

answers were very just to regulate husbandry so long as she was taken for what she was, that is, for a cluster of stars under which the sun placed himself at the time which brought on harvest, and reddened the ear of corn. And because the Egyptian harvest did not fall under that sign, but under the ram or the bull, it is, that Egypt flocked to the oracles of Ammon or of Apis, and had so particular an affection for Isis with the horns of a heifer, the ancient proclamation of their harvest; whereas all the East consulted the Erythrean sibyl, in order to be assured of a plentiful crop. This language became the matter of fables. Our maid changed from a sign to a prophetess, had no doubt the most perfect knowledge of futurity, since people came from all parts to ask her questions. The excessive wickedness of mankind at last obliged her to quit their abodes, to go and in the heaven take possession of the place due to her. Many countries assumed to themselves the honour of having given birth to this sibyl: nor would it be a hard matter to find seven instead of one. All the current predictions, among which some strokes of the prophecies addressed to the people of God are found, in time passed for the answers of these sibyls (a).

X.

The origine and power of Talismans.

ERRORS go hand in hand as well as truths, and one succeeds another. The worship of the celestial signs and the planets being once introduced, their figures were multiplied in order to assist the devotions of the people, and render them useful. These figures were of cast-iron and in relievo, oftentimes in form of coin, or like portable plates of metal, in which

(a) See upon this subject Catrou on the sixth eclogue of the excellent remarks of P. Virgil.

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they made a hole, to hang them with a ring round the neck of children, sick persons, and dead bodies. The cabinets of virtuoso's are full of these plates or amulets, which have on them the stamp of the letter T, of the sun, or of its symbols, of the moon, the other planets, or the several signs of the zodiack. In the East, these figures were called Tselamim, *images* (a). These we call talismans: but talisman is a mighty word, which imposes still upon people for want of being understood.

Painting and carving, two arts invented to instruct and assist the piety of men, served however but too much to destroy it. Interest and cupidity raised to excess the credit of these little figures of the planets and the different stars. The persons who carried them about them could make no doubt, when just recovered of an illness, but that they were indebted for their restoration to them. It was observed in particular, that they had prodigious virtue, and became preservatives of long duration when they were made at the precise time of the rising of the star they represented. The whole substance and power of the influence no doubt then entered into them. When they happened not to succeed, the true reason of the decay of their virtue was geometrically found out in the intersection of the lines of activity of some adverse power; and this outside of learning caused religious acts to be performed with still greater caution. Talismans were long in vogue. Trifles which promise much, and cost but little, easily obtain favour among the people; and even now, when offered under the pompous name of constellated figures, they often impose upon persons who fancy themselves of a class far above that of the vulgar.

The slightest conformity with the star or the god in which men placed their confidence, a small pre-

(a) From צֶלֶם *tselem* comes צִלְמִים *tzelamim*.

caution added, a little resemblance more sensible, caused an image or the matter to be preferred. Thus the images of the sun, in order to imitate the brightness and colour of it, were to be of gold. It was not even doubted but that gold was a production of the sun. The conformity of colour, brightness, and merit, was a sensible proof of this. The sun therefore could not but have complacency in a metal he had undoubtedly generated; and infallibly shed his influence upon a plate of gold on which he saw his own image stamp'd, and which had been religiously consecrated to him the very instant of his rising.

By a like method of arguing the moon produced silver, and communicated the full extent of her power to the silver images to which she was related by colour, generation and consecration.

To be sure Mars loved to see his own images when made of iron. This doubtless was the favourite metal of the god of battle. By an extension of this fine way of reasoning, the other planets had also the superintendency of some metallick matters. Venus presided over copper: nor could less well be expected from this goddess, since copper was found in plenty in the island of Cyprus, a residence which she was very well known to have a singular affection for. Languid Saturn was set over mines of lead. No greater deliberation was used to assign Mercury his district. A certain relation in point of activity, caused him to have the quick-silver for his province. But upon what account shall Jupiter be confined to the superintendency of pewter? It was indecent to charge a god of his rank with so abject a commission. It was a debasing of his dignity. But pewter was the only lot left him, and he must needs have been contented therewith. These are certainly powerful motives of assigning to these gods the inspection over such or such metals, and a singular affection for figures made of it. Now

such are the reasons of those pretended provinces, such are likewise the effects to be expected from them.

XI.

Climacterical influences.

MAN's mind always readier at drawing the just consequences of a false principle than at making itself sure of the truth of that principle, had no sooner conceived this frivolous relation between the metals and the planets, solely founded upon the character of the gods itself had lodged there, but seeing one particular metal abounding in one country and another in another, it at once concluded that the planet which favoured the generation of that metal there, doubtless presided over the whole country. Each country had then its predominant planet, whose power was extended to the plants, the animals, and even the dispositions of the mind. All was lead in one country : all was mercury in another. By degrees the system of the planets served to account for every thing. All was made dependent on one of the seven wandering stars. Each member of the human body had its tutelar planet. Each hour of the day had also its own. The number seven was decisive in every thing. They reckoned by sevens the years, months, days and hours. Each seventh year, day or hour, was of consequence. But the periodical return of seven times seven, which was called the climacterical period (*a*), was, and still is in the opinion of many a dangerous year, a critical day, or an hour which men are mighty glad they have escaped unhurt. The climacterical returns appeared important situations and conjectures, capable of powerfully influencing an illness, the condition of private men, the fortune of princes, the success of battles, and the government of

(*a*) From *κλίμαξ*, a winding stair-case.

states. When an event did not answer the impressions of the predominant planet of the climate, it proceeded from the prevalence of the weekly planet. When a thing could not be explained by the situation of the planet of the day, they had recourse to the hourly star. Of all these chimæra's and of many others whose conformity with some particular event was every where cried up, while daily experience demonstrated the falsehood of them in a thousand other cases, a dark gloomy science was formed, which obtained credit, as it was fit to impose upon people by Greek or Arabic names, and to dupe eager minds by the promises of long life, grandeur, riches and health. The calculations made with a shew of regularity, and beforehand promised those who desired to be informed of the climacterical return, have often thrown certain minds into the utmost trouble at the approach of those moments, which in reality had no greater virtue in them as to good or bad than other periods, and the apprehension of this imaginary evil has at all times proved mortal, or given men the most poignant uneasinesses, and effectual diseases. Unhappy events indeed! which instead of inspiring men with horror for any kind of prediction whatever, are still to prejudiced minds motives of preserving an esteem for an art altogether delusive.

There is a much less appearance of truth in the power ascribed to Saturn or Mars than in that attributed to the moon, which at least is very fit by its phases to measure out the duration of favourable or contrary winds. Now the remarks of our fishermen, of our judicious gardeners, our surgeons of integrity, and a thousand trials made and carefully repeated for some years last past by Messieurs of the academy of sciences, and by other most cautious and attentive men, have convinced us, that the moon has neither heat nor any kind of influence whatever on the gene-

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ration of any terrestriall or aquatick animal, nor on the generation or alteration of any living or vegetative being that exists. What will then become of the malignity of Saturn, the favourable aspect of Venus, and the riches of Mercury? All these distinctions and systems are a pitiful consequence of the character and inclinations of the gods whom Egypt, Phenicia, and Greece have imagined to be in certain stars, in which they had equal reason to imagine the reverse. All practices grounded on this persuasion can therefore be nothing but superstitions destructive of piety, sciences, and society. Of society, since they tie men up to no manner of purpose; of sciences, since they stop the progress of them by busying us about causes productive of no effects; and of piety, since, without being professed idolaters, we nevertheless commit idolatrous acts, and since, after having renounced all these gods of antiquity, we do not abjure the virtues and operations, the belief of which they had introduced.

XII.

The origine of alchymy.

FROM the persuasion men were under that each planet ingendred its peculiar metal, they by degrees came so far as to say, that one planet being more powerful than another, the metal ingendred by the weakest was converted into another metal under the influence of the stronger. Therefore lead (a true metal, as perfect in its kind as any other, but half a metal in the opinion of our astrologers, and a production miscarried) remained imperfect by the debility of Saturn, was converted into copper under the aspect of Venus, into silver under that of the moon, and at last into gold under certain aspects of the sun. From one extravagance to another we reached that of the alchymists, who gave and still do give the seven metals the names of the seven planets, and who, not being con-
tented

tented with believing that the generation and transmu-
 DIVINA-
 ration of the metals was more or less forwarded under TION.
 the successive impressions of the planets, took it into
 their heads themselves to find out means for hastening
 on this generation or transmutation, which the pla-
 nets perfected, as they imagined, too slowly. Nature
 and experiments offered them a thousand methods of
 curing themselves of their mistaken notions. In the
 places where there had been abundant mines formerly,
 they saw no new ones appear again. After the fre-
 quent voyages of the Phenicians to Andaloufia had
 exhausted the gold and silver-mines which formerly
 were in the neighbourhood of the river Guadalquivir,
 and the avidity of the Romans had gleaned the re-
 mains of what had escaped the hands of the Tyri-
 ans, the sun and moon did not shine less bright on
 Spain than they did in the first ages of the world.
 These planets were not become less powerful in that
 country than in others where our alchymists supposed
 they digested metals anew. The long inaction of the
 sun in Spain sufficiently shewed them that the gold of
 Chili or China is neither concocted nor ingendred by
 that star. But as they had undertaken the transmuta-
 tion of metals upon the principles of a set of physicks
 which look on matter as a mass equally fit to form
 gold or glass, and whatever they should think proper
 to produce from it; when we come to the examina-
 tion of the principles and attempts of these physicks,
 it will then be more proper than at present to shew that
 the hand of the alchymist is not of greater efficacy in
 the production of metals than Saturn, Jupiter, or the
 sun itself, whose weak virtues in this point are now
 too well known in the world.

XIII.

Conjurations.

I am still to inquire into the origine of an art far
 more

more important than all the foregoing. This is necromancy, the art of calling up the spirits of the dead, and of making them speak. The reader will not be displeased here to find the key of the occult languages, and to be acquainted how magicians went about asking questions of hell, and conversing with the devils. This is mighty curious. It is indeed the quintessence of the science magick.

A respect for the human body which was known to be destined for a better state to come, and one day to rise from the dust, induced the first nations to interr the dead in a decent manner, and always to join to this melancholy ceremony, wishes and prayers, which were expressions or a profession of their expectation. The men of low condition were interred and lamented at least by their relations. Whole cities came to shed tears over the tombs of illustrious men, who had made themselves famous by a wise government, or by giving the chase to voracious beasts, by some useful invention, or some other service. The place of the grave was pointed out by a stone raised thereon, conformably to the custom of characterising all beloved places, or those distinguished by some memorable event, by erecting (a) a pillar thereon, or simply a stone that might attract the eye by its situation. Families, or even whole nations according to the greatness of their concern, assembled near those stones when the year came about. They made libations of oil and wine upon the stone, sacrificed and eat in common. They all began their sacrifices by giving thanks to God as we still do (b), for having given them life, and for multiplying every day all necessary foods for their sakes. Then they praised him for having given them useful men, and good examples to follow, (a practice the observation of which we have faithfully

(a) See Genes. 28. 17 and 18.

(b) *Hæc omnia, Domine, semper bona creas.*

retained) or they glorified God for the peculiar occasion of each solemnity. Funeral assemblies were the most frequent, because men died every day, and these meetings were repeated on every anniversary. They were not only the most common, but also the most regular; because the sadness inseparable from them banished thence the licentiousness which disfigured other feasts, even before the introduction of idolatry. They began by introducing into the latter arbitrary embellishments, and especially representations adapted to the object of the feast: a natural occasion of many disorders. Of this we have seen instances in the feasts of Osiris, Isis, and Saturn.

Every thing was simple in the ancient feasts. Men met upon some high and remarkable place. They made there a small pit, wherein to consume the entrails of the victims by fire. They made the blood flow into the same pit. Part of the flesh was presented to the ministers of the sacrifice. They boiled the rest of the offering immolated, and eat it sitting near the fire. By degrees, and especially after the introduction of idolatry, they swerved from this simplicity. The symbols which had given birth to idolatry, striking the eye by the singularity or the beauty of their figure; men took a liking to decorations, and every day introduced some new refinements. Instead of sitting upon the grass, they sat upon skins, carpets, and at length upon beds that were high and magnificently covered. Instead of a hearth dug in the ground, they erected a table which was called an altar, or at least a large vessel set upon a magnificent support *, to receive the fire and a part of the victim which was thrown into it with a handful of frankincense; which overpowered the ill smell of the blood and burnt fat. Each feast insensibly got a ceremonial peculiar to it, proper representations, and an altar of a determined character. This altar was surrounded with foliages, and

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TION.

* A trevet.

and these soon became as various as the figures of the altars. A crown of oak-leaves was required in such a feast, and a chaplet of myrtle in another. The altar sometimes was to be of stone, sometimes of wood, another time of simple green turf, or of a heap of earth surrounded with common herbs. What had been approved on some important occasion, afterwards passed into custom, and became a law. The number, the characters, and the histories of the objects which men took for gods, afterwards gave birth to a thousand varieties, which appeared very important rites and necessary precautions. Whoever should have neglected one single point of the ceremonial prescribed, had nothing less than the plague or famine to apprehend. Whenever the gods in that case were contented with only sending a transitory tempest or some furious beast among them, the fault was reckoned very cheaply atoned for. Each feast having its proper service and decorations had a peculiar name. It was not thus with the funeral assemblies: nothing was changed in them. They were void of joy and decoration. Men went on with practising what had ever been done. The families in interring their dead, were accustomed to a common rubrick which was perpetuated. It is then in the service of the funerals especially, that we may again find the principal of the usages of primitive antiquity. At these solemnities, they continued to make a ditch, to pour out wine, oil, honey, milk, or some other liquors in use, to shed the blood of the victims (*a*), to roast their flesh, to eat it in common sitting round the pit or the hearth, and discoursing of the virtues of him they came to lament. These assemblies continued to bear the name given to all solemn convenings.

(*a*) *Inferimus tepido spumantia cymbia lacte,
Sanguinis & sacri pateras.*

Æneid. 5.

See the same ceremony in the anniversary of Anchises, *Æneid. 5.*

While

While the other feasts, on account of the diversity of the ceremonies were called Saturnalia, Dionysia, Palilia, &c. the funeral assemblies were simply called *the Manes* (a), that is, the convening or the regulation. Thus the *Manes* and the *dead* became two synonymous words, or were indifferently used one for another. And as the things which gave names to the feasts, were generally become the objects of an extravagant worship; the *Manes* or the *dead* became likewise the object revered in the funeral ceremonies. The strange facility with which the minute parts of the universe were deified, is a hint to us how the custom was introduced of directing prayers, vows, and religious worship to the dead whom they had loved, whose praises were celebrated, and who were thought to enjoy the most refined knowledge, after they had together with their body cast off the frailties of humanity.

The ancient sacrifices were not only eucharistical. In the time when the Most High was as yet worshipped, they were looked upon as an alliance contracted with him, and whereby they engaged themselves to be faithful to him. This notion was grand, affecting and instructive. I shall here mention neither the reasons nor any instances of it. The former are palpable, and the scripture swarms with the latter. Nothing was more capable of innobling the feasts, and of preserving in every mind sentiments of the most sublime love and respect, than the thoughts that they were going to appear before the Lord, to covenant and converse with him.

Idolatry impaired, but did not destroy this persuasion. All nations, when they sacrificed either to

(a) From מָנוּחַ *manim*, distributions, vices, reditus, solemnitas. This name was given to the symbolical figures. In particular it remained the name of the image of the dead person which characterized a funeral assembly.

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the gods they had framed to themselves, or to the dead whose memory was dear to them, thought they entered into an alliance, conversed, and familiarly eat with them. But this familiarity ingrossed their thoughts most particularly in the funeral assemblies, in which they were as yet full of the memory of the persons they had tenderly loved, and who, as they thought, took always a great part in the concerns of their family and country.

We have heretofore observed, how cupidity and ignorance having rendered all men indifferent as to justice, had led them astray as to the object of their worship, and had afterwards converted every part of it into so many means of being relieved in their illnesses, instructed in futurity, and provided of all proper means to succeed in all their undertakings. Every object in nature spoke to them. The birds in the heaven, the serpents and other animals on the earth, a simple rod in the hand of their minister, and all the instruments of religion, were so many oracles and prophetic signs. They read the stars, and the gods spoke or revealed their intentions to them from one end of nature to the other. This covetous and gross religion which applied to the gods merely to ask them questions in matters of interest, was no less inquisitive and thought it had a right to be still better served in the funeral-sacrifices than in all the rest. Men in these ceremonies thought they had to deal with affectionate gods, which, on account of the concern they still had in the prosperity of their family, could not but inform them in time of whatever might be of service or detrimental to them. The whole apparatus of the funerals was then again interpreted in the same manner as that of the other feasts; and the whole was converted into so many methods of divination.

The

The ceremonies of the *Manes*, though they were DIVINATION. but the bare practice of the assemblies of the primitive times, being in every respect different from those observed in the other feasts, appeared so many different methods of conversing with the dead, and of obtaining the desired informations from them. Who then could doubt but it was in order familiarly to converse with their ancient friends, that men sat down round the pit into which they had thrown the oil, the flour, and the blood of the victim they had killed to their honour? How could it be doubted but that this pit so different from the altars set up and pointing towards heaven, was a suitable ceremony, and peculiarly belonging to the dead? The dead evidently took pleasure in these repasts, and especially in what was poured into the pit for them. Doubtless they came to consume the honey and the liquors which disappeared from thence: and if their friends were contented with offering them liquors only, no doubt it was because their condition as dead persons would not admit of gross foods. Men were then so extravagantly credulous as to believe that the phantoms came to drink and voluptuously to relish these liquors, while their relations feasted on the rest of the sacrifice round the pit.

After the repast in common between the dead and the living, came the interrogation, or particular calling up of the soul for which the sacrifice was appointed, and who was to explain her mind. Every body is sensible that an inconvenience attended the ceremony, it being to be apprehended that the dead might croud about the ditch, to get a share in this effusion which they were so very greedy of, and leave nothing for the dear soul for whom the feast was designed. This was provided against. The relations made two ditches. In one they

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they threw wine, honey, water and flour, to amuse the generality of the dead: in the other they poured out the blood of the victim then to be eaten in common by the family. They sat upon the brink of the latter, and with their swords near them, they kept off by the sight of these instruments, the croud of the dead who had no concern in their affairs. They on the contrary invited and called up by his name the deceased, whom they had a mind to hear and consult. They desired him to draw near. The dead seeing that there was there no security for them, flocked and swarmed round the first ditch, the access to which was free, and politely abandoned the other to the privileged soul, who had a right to the offering, and who knew the bottom of the affairs about which she was to be consulted.

The questions made by the living were distinct and easy to be understood. The answers on the contrary, though very certain, were neither so quick nor so easy to be unravelled. But the priests who had been taught in their labyrinth how to understand the voice of the gods, the answers of the planets, the language of the birds, the serpents, and the mute instruments, easily understood the dead, and became their interpreters. They reduced it into an art, whose most necessary point and what best suited the condition of the dead, was silence and darkness. They retired into the deeper caves: they fasted, and lay upon the skins of the sacrificed beasts. When they waked or after a watch, which was fitter to turn their brains than to reveal hidden things to them, they gave for answers the thought or dream which had most affected them. Or they opened certain books appointed for that use: and the first words which offered at the opening of them, were precisely those of the prophecy

ex-

expected : Or in short, the priest and sometimes the person himself who came to consult, took care, at going out of the cave, to listen with attention to the very first words he could possibly hear, from what part soever they proceeded, and they were to him in lieu of an answer. These words for certain had no manner of relation or connexion with the business in hand : but they were turned so many ways, and the sense of them so violently wrested, that they must needs have given way some small matter. Commonly enough they had in appearance some relation to it. They sometimes, instead of the foregoing methods, had recourse to what they called *Sortes*, viz. a number of tickets on which there were some words written at random, or some verses already current, or newly coined. These tickets being thrown into an urn, they were stirred very well together, and the first ticket that was drawn was gravely delivered to the distressed family, as the means to make them easy. Methods of divination were multiplied without end. The whole of religion was almost converted into so many methods of knowing futurity. Certain places obtained a greater reputation than the rest ; and such was the origine of Oracles. This matter has been sufficiently treated upon (a) by the learned : it would be needless to resume it.

It may be objected, it is evident, that the practices above-mentioned were extremely fit every where to spread this extravagant persuasion, which is still preserved among the people, that we may converse with the dead, and that they often come to give us advices. But what proofs have we, that

(a) See the dissertation of oracles, and the reply of P. Vandale upon the Heathen oracles. See the history of the Baltus.

these so very strange practices have been formerly common?

If I can again supply my readers with the proofs of this custom, or rather of this perverse abuse of the funeral ceremonies; I shall, methinks, have sufficiently shewn, that the opinions of men upon the gods, the dead, and the answers that may be obtained from either of them, are nothing but a literal and gross interpretation made of very plain signs, and of still plainer ceremonies, whose purport was to express certain truths, and to fulfil certain duties.

Because all nations flocked to high places, there to shed the blood of the victims into a trench, and to converse with such or such a dead person by keeping off others by the sight of a sword, it is, that scripture so often and in so express a manner forbids the Israelites *to assemble upon high places*, or (which was frequently the same thing) *to hold their assembly near the blood (a)*, or *to eat sitting round any pit sprinkled with the blood of the victims*.

The custom of using the sword in these funeral sacrifices, to chase away the souls they had no mind to call up, is attested in the reproach which the prophet Ezekiel gives the Hebrews, of having *eaten the flesh of their sacrifices near the blood which they had shed, and of having had their sword by them in this abominable * repast*.

* Ezek.

33, 25 and
26 Hebr.

† Odyss. A. Homer, more ancient than Ezekiel, shews us † the same practices among the western nations, and

(a) לֹא תֵאָסְפוּ עַל הַדָּם לֹא תֵאָסְפוּ עַל הַדָּם lo
thocelou wal haddam, non comedis juxta sanguinem, or super
sanguine, or circa fossam victimarum sanguine conspersam.
The LXX interpreters knowing perfectly, that this was what
drew the people to the high

places, have very well translated this passage of Leviticus 19.
26. and other the like by these
words, μὴ ἐσθίετε ἐπὶ τῶν ὄρεων, ye shall not go and eat upon
the mountains. Here to eat is
the same thing as to sacrifice.

here

here becomes an interpreter of scripture. Ulysses being willing to question the soul of Tiresias, reputed to have a far greater knowledge of things than the rest of the dead, concerning his return to *Ithaca*, begins by pouring into a hole honey, wine, water and flour, in honour of the generality of souls deceased, to keep them imployed apart in consuming this: then in another place he makes a second pit, into which he pours, particularly in honour of Tiresias, the blood of a choice victim. *He then places himself over the blood (a), or near it, sword in hand. He disperses the light shades that were greedy of it, and hinders them from tasting it before he has consulted Tiresias (b). This soul by name called up comes at last: she intreats the hero to retire from the trench, and to remove his sword, the sight of which frightens her, that she may drink the blood poured out to her honour, and then acquaints Ulysses with the truth he is concerned to know (c).*

This divination was then grounded, as all the others were, upon the perverse sense given to some ancient ceremonies very simple and innocent in their origine, but which became so many acts of idolatry, or the occasion of an impendent idolatry, from the false interpretation that was given them. The turn, therefore, which the ceremonies took in the

(a) Ἀνδρὲν ἐφ' αἵματι φάσγανον ἴστων.

(b) . . . Οὐδ' ἴδων νεκρῶν ἀμειννά καρνέα

Ἀιμάλος ἄσπον ἵμην, πρὶν Τηρεσίαισιν πυθέσθαι.

(c) Ἀλλ' ἀποκάζεο βέθρε, ἀπίχε δὲ τὸ φάσγανον ὄζυ;

Ἀιματόν, ὄρα πῶς, καὶ τοὶ νημερτέα εἶπω.

The same usages are found in the poem of Silius Italicus:

Educlamque tene vagina interritus ensem.

Quacunque ante anima tendunt potare crurore,

Disjice, &c.

minds of the people, is an additional proof of the gross manner in which they have made persons of, or realized the symbols themselves. From all we have seen it results, that idolatry, astrology, the auguries, conjurations, and the art magick, are all of them practices equally absurd and deceitful, proceeding from the false interpretation of the ceremonial, occasioned and maintained by the cupidity of nations, authorized without any examination by universal usage, and supported by the avarice of the priests. These perhaps were persuaded of the excellence of their own predictions, which could hardly fail sometimes to have an appearance of accomplishment. It is very credible that when they were contradicted by the event, they imposed upon and seduced themselves, by the intervention of that crowd of powers always intent upon confounding every thing in the world, and that they very sincerely had a value for an art which procured them a comfortable livelihood.

In reducing idolatry and divination, which have so strangely dishonoured reason, to mere illusions caused by cupidity and ignorance, I am very far from thinking that the evil spirits have not exerted upon mankind that measure of power which God has granted them according to the impenetrable and always adorable designs of his wisdom. On the contrary, I am convinced of their existence as well as of their efforts towards undoing us, and in particular of the vexations they have been rendered capable of exercising upon the bodies of the demoniacks, for the manifestation of the powerful grace of our Saviour. I own moreover, that God has sometimes permitted the spirits of darkness, by certain equivocal appearances, to comply with the desires of magicians and seduced nations. But what he granted to criminal desires was also their punishment.

nishment. All these arts however are not a whit less deceitful (a), void of reality, and destitute of rules, since they all owe their birth to the oblivion of the sense of the first institutions that were given to men upon the course of the sun and moon, upon husbandry, the regulations of society, and the gratitude due to the author of all good.

(a) The scripture itself supplies us with proofs of the impotence of the gods, and of the cheats of their ministers. See the history of the priests of Bel, in Daniel.

The end of the first Book.

THE
HISTORY
OF THE
HEAVEN.
CONSIDERED

According to the notions of the POETS,
the PHILOSOPHERS, and MOSES.

BOOK the SECOND.

COSMOGONY,
OR

The Formation of the HEAVEN
and EARTH.

According to the notions of Philosophers.

COSMO-
GONY.

IN examining into the origine of the heaven of poets, and of the whole Heathen religion, we have not lost our time in fruitless researches, nor in studies of pure curiosity. We have seen the

the strange illusion of which man becomes the sport, *The CHAOS*
when the love of justice and truth does not rule
his heart. We have seen, and possibly with some
benefit, the birth and absurdity of many pernicious
opinions, in favour of which so many people
still are strongly prejudiced. In short, we have
begun to intimate the excellence and inestimable
value of Moses's narration : since, amidst this crowd
of fables added in after-times to the ancient tradi-
tion, we have in Paganism again found the same
grounds of histories and customs, nay, of primitive
truths which have been preserved in Moses's reci-
tal. And indeed we have on either side, and long
before the law was given in the wilderness, the
sacrifices, the neomeniæ, the dedication of monu-
ments and of altars by effusions of oil and other
libations, the funeral honours, the expectation of
a better life to come, and the universal persuasion
of a justice which will treat every one according to
his works. We have again found in Egypt the
sensible footsteps of the dwelling of Cham. In the
opinions of the eastern nations upon the origine of
the gods, we have seen some vestiges of the history
sometimes of Abraham, sometimes of Noah ; the
memory preserved of the division of the earth
among the children of the latter ; the knowledge
of the restoration of husbandry by a single man
rescued from the flood ; the remembrance of the
ark ; the very distinct knowledge of a total diffe-
rent state both in nature and society before and
after this event ; in short (this is very observable,
and opening the book of Ovid's metamorphoses is
sufficient to convince us of it) the twofold origine
of man, whom Paganism as well as the scripture
derives from clay and from the heaven at the
same time : from the clay or earth mixed with
water, because he lives in a body of which the

terrestrial elements are the basis ; from the heaven, because he has received a life, a soul, and an understanding altogether celestial.

Here my readers would have just reason to complain, if I should not return to the very chaos, of which both the poets and Moses have spoken. It is a notorious truth, that the poets, the philosophers, the polite and the barbarous nations have preserved the memory of a state of darkness and confusion, which had preceded the present œconomy of the world. Nor can we deny but these precious remains of the history of the world in its birth, notwithstanding the accessory notions which each nation and each philosopher have by degrees added to it, is still a testimony universally born to the truth of Moses's recital. But if we compare the chaos which is found in the tradition of the Hebrews with that admitted by the poets and philosophers, we shall see nothing but exactness and truth in the former, and find nothing but mistakes and absurd or even dangerous consequences in the latter.

I.

The chaos of Philosophers, or the primitive matter.

T H E R E is none but will here acknowledge the falsity of the poetical chaos. The reader is shocked at seeing a person there made of silence, another of *Erebus*, or *the night*, a third of *Ne* or *matter* ; to hear searches after the genealogy of people of this kind, and of many others which may be seen in Hesiod, and in what Eusebius has handed down to us of old Sanchoniathon. The most probable things that can be said concerning these

these ancient cosmogonies, is, that men at all times have pretended to penetrate further than they were allowed to do, and that they formerly made systems upon the origine of the world as they do at present, instead of being contented with the simplicity of the history we have of it. Very likely the masters contracted their ideas within a narrow compals, by giving them an air of allegory, and by causing the principal objects of their systems to move and act as so many living and animated personages. They thought they rendered their doctrine more sensible by this dramattick outside. They put it in verses and to musick, that it might be more easily retained, and deferred the extending it sufficiently to their after-explications. But by misfortune these allegories as well as all their fables, and even their jests upon the ancient symbols, were perpetuated as so many histories, which by degrees have swelled the monstrous bulk of the Heathen mythologies. Let us abandon all these ill-matched fictions, after having observed among them a considerable number of very sensible footsteps of the truths of which the people of God have been the faithful trustees. The study of Paganism can hardly be rendered solid and beneficial by any but a labour carried on to this purpose. It is making error and even falsehood itself subservient to our edification : It is fetching gold out of mire. But our business is no longer to see in what the fable may relate to the holy scripture : Our comparison shall run for the future between Moses and the philosophers. Let us begin with their chaos : It is the point from which we see them all set out one after another.

The love of worldly blessings is not the only passion that racks mankind. The thirst of knowledge has almost as powerful an influence upon the human

TheCHAOS.

The ori-
gine of all
errors.

human heart. God has been pleased for man's sake to join a pleasure and an allurements both to the using the supports of his health, and to the knowledge of the truths which are of concern to him. But these bounties of the Almighty, so wholesome when moderately used and with thankfulness, may be converted into so many poisons, when man knows neither how to set bounds to nor how to direct the use of them. An excessive love of earthly blessings has rendered him idolatrous, and caused him to mistake whatever surrounded him in heaven and on the earth, for so many venerable powers, or for so many oracles which informed him every instant of his minutest concerns. An immoderate desire of knowing every thing, likewise made him deviate from that kind of knowledge within the bounds of which God had placed him, to run after frivolous and vain systems, which take in no less than the universe and its parts, which from the beginning of the world, even to our very time, produce and drive out each other without being able to maintain themselves, or being any way accessible to our understanding.

Let us not look out among the Chinese, Indian, Arabian, or any other Asiatic doctors, for their thoughts concerning the origine of the world, and the fabrick of the heavens. Our Europe is sufficiently fruitful in sublime conceptions upon this matter, and we need not leave our own cantons to find out systems. Let us put together our most famous naturalists, such as Democritus, Epicurus, Lucretius, Gassendus, Aristotle, and Descartes, with the numerous family of the scholasticks. Let us place all these great masters in presence of Moses, and draw out a parallel of his doctrine and theirs. The result will be this: When these philosophers have

have taken their own reason for a judge of the *The CHAOS.* structure of the world, which they never were appointed by God to construct, govern, or understand ; all what they have, each of them apart, imagined about the chaos and the formation of the world is needless, unintelligible, beyond our reach, and evidently contradicted by experience. On the contrary, what Moses tells us of the creation is simple, plain, full of grandeur, and perfectly agreeable to the experience of people of all places and ages.

All the philosophers, though under different terms and expressions, have admitted a chaos of corpuscles, indifferent as to entering into the composition of all sorts of bodies ; a vague, undetermined, universal matter, of which they pretend that all things have or might have been made by the bare impulse of motion. Now, it is upon this indifference of the corpuscles towards becoming whatever you please ; it is upon the possibility of forming a world with the corpuscles by the bare introduction of a general motion, that I believe I must bid our system-makers to stop.

If a mass of iron, a measure of water, a handful of sand, may, by the impression of a motion made in a direct or curved line, become an organized body, or even any thing other than iron, water or sand ; I consent to say that a chaos of corpuscles has been able, by the application of a general motion, to become a world. But if that mass of sand moved and violently agitated, can never be organized, nor even become any thing but sand ; it thence follows, that matter of whatever kind you may be pleased to imagine it, let it be moved in a circular or strait direction ever so long, there can result nothing from it but a chaos, and never a world. The only special intention of the artificer,
not

not a simple motion, can form the whole machine, and every one of the parts it is composed of. Here the whole world will fall into dispute. But pray, let us agree together ; let us lay aside our notions and arguments, and I my own above all, since I value them still less than those of others. Let us not any way rely upon the manner in which things may be ranged in the heads of philosophers, since that would be the means to have as many systems as heads. Let us, in short, take experience for our judge, and examine nature.

Let us go into the laboratory of an alchymist (a). There the preparatives of a transmutation are making. We may see all the operations, and in little make the experiment of the conversion of the chaos into a well ordered world. The distance is doubtless much greater from the chaos to an organized world, than from a piece of iron to one of pure gold. But if this last transmutation is impossible, the other is certainly at an end. Let us then look into the crucible, into which the alchymist is very sure he has put nothing but matters well known, perfectly refined, and without the least grain of gold. After many preparatives and scrupulous precautions about the degree of the fire, after the most religious observation of all the rules, what do we find in it at last? not even the least grain of gold. To this abortive operation if we join all the other operations of the laboratory, I will venture

(a) We must with great care avoid confounding the alchymists, or the hunters after the philosopher's stone, with the chymists who bestow their labour, not upon the transmutation, but upon the purifying of metals, and separating or decomposing the principles

which form compound bodies. Philosophy borrows many useful knowledges, and society very great helps, from chymical operations. The following article will shew, what opinion we are to entertain of the work of the alchymist.

to say before the director of the whole, that he *The CHAOS.*
may very well mix or separate, but can never, by
any imaginable motions, obtain the transmutation
of any thing. His operations shew, that there are
compound bodies, and bodies simple in their na-
ture: that those compounded may be analyzed or
resolved into those which compose them: that the
bodies disjoined may be drawn together again, and
form new compositions; but that there are a good
number of bodies, which have a determined and
invariable nature. Such are the water, the earth,
the sand, the gold, the silver, all the metals, quick-
silver, and many others, which being agitated, tor-
tured, disunited and mixed so long as you please,
are found for ever the same, admit of no manner
of analysis or decomposition, and can never, by
any imprinted motion whatever, be transmuted
into any thing but what they are. Motion may
disunite or blend them. It may very well produce
a chaos. But an experience of a thousand, nay, of
six thousand years has shewed us, that if a chaos is
formed of gold-dust, of drops of water, and of
grains of sand thrown promiscuously together, a
golden-mass will never come out of it in which the
water and the sand are converted into gold.
Nay, more: this mass of corpuscles is so very far
from being able to become a world organized or
composed of regular pieces, that, if, for instance,
there is not as yet any iron in this mass or in that
chaos, it might be stirred a thousand years toge-
ther, before any grain of iron could ever be fetch-
ed out of it. For this I would give the reasons if
I had a right to speak. But we took experience for
our judge.

How! some will gravely say, what need have
we to tire ourselves with making of trials? Is
it not enough for us to have matter extended in
length,

length, breadth, and depth, to be able to fetch out of it whatever we see in the world? 'Tis true, you may fetch whatever you please out of this matter, when you work it upon paper or on the seats of a school. There it proves perfectly pliant and tractable. But it is not so in the laboratory. The master who directs there, with all his heart and soul wishes that the philosophers were in the right. This docility of matter would serve his turn admirably well. But he can tell us how much grief and affliction the obstinate resistance of matter has given him. He is now looking out for the transmutation: but he has not found it yet for certain. Let him here explain himself.

II.

The principles of the alchymists.

A L L is lost, cries our alchymist, if it be once supposed that the transmutation of metals is impossible, and that they are simple and elementary bodies which God has at first constructed of an invariable nature. Maintaining this doctrine is robbing man of his finest privilege. One person degrades him from the sovereignty he is to exercise upon earth, and another aims at no less than at shutting against him the door of wisdom, by persuading him that all the natures which enter into the composition of mixt bodies, were made at the beginning: that all man can do is, to make use of what already existed; but that he produces and changes nothing: and that the *seeking the philosopher's stone*, the object of so many wishes and researches, is nothing but a vain fancy, since metals are actually all that they ever will be, and since they are pretended incapable of being generated or altered.

Alchymy,

Alchymy, which would load its adepts (*a*) with riches and health if it were but encouraged with great hopes, shall then for the future be reduced to the extraction of a few grains of gold or silver dispersed among a lump of other matters; to the filtration of a few salts; to distillations of but little use, and to the confection of some phosphorus's fit to amuse children, or at most capable of replacing in the hands of a virtuoso the too vulgar use of the flint. Will any one be able to conceive that so many great men, who from the time of Trismegistus (*b*) to our very days have bestowed their labours upon the transmutation of metals, the making of

The PRINCIPLES of the ALCHYMISTS.

(*a*) Those whom they imagine to have obtained the conversion into gold of what was no gold.

(*b*) They put in the Egyptian temples the books containing all the theology, the sciences and ceremonies of Egypt. These books were attributed to Mercurius Trismegistus. *S. Clem. Alexand. Stromat. lib. 6.* The Alchymists who look upon this Mercury as the inventor of their art, out of gratitude give him the pompous name of *Mercury three times great*. But it is with their art as with its author. The whole is ideal, and nothing else. We find two Mercuries in the Egyptian chronology. One invents writing and the sciences; the other brings them to perfection. One is son of Maia and of Menes or Osiris; the other is the son of Vulcan. The first, in good truth, is nothing but the symbol of the dog-star, which serving to regulate the operations and feasts of Egypt, passed for the

founder of the feasts and regulations; for an industrious man who had served his fellow-citizens, and by the best inventions assisted the government of his father. But we know Osiris, Menes or Horus, Maia, and Anubis or Mercury. They are granted to have afforded instructions to mankind. But how have they done it? They instructed in the same manner as our signs inform us: and attributing industry or a genealogy to Mercury, is the same thing as believing that the golden lion came from the desert of Zara into our streets, and that the dolphin which denotes a public house has received the faculty of speaking. The second Mercury, whom they pretend to be the son of Vulcan, has nothing more real in him than the foregoing. All these Egyptian genealogies are popular stories of which we saw the birth, and which deserve not to be seriously mentioned.

potable

potable gold, and the confection of *the universal restorative*, have run after chimæra's? No sure: we know better than any man, what must be thought of these wonderful changes every day brought about under our hands. A particular nature, as simple as you may be pleased to suppose it, must needs be capable of becoming another, by the transcendency of our learning, since we every day destroy silver, copper, and all other metals, and afterwards revive them again when we please. We every day destroy lead to have minium and ceruse: but they both shall become lead again whenever we will. We not only kill and restore to life; but we really transmute the metals. We cause one to become another, and a vile nature to be changed into the most precious. We for instance cast into a crucible a small quantity of silver in grains and of cinoper (a) broken into small pieces. The whole being melted, we find again the grains of the same bigness, and all the cinoper converted into silver. Nay, we do something more wond'rous still.

We unite two different matters together, and of the two we form a third which has no manner of relation to either of them. Clay and lin-feed-oil have nothing common between them. Now, of these two matters we form a pure iron, which has nothing in it of the nature of lin-feed-oil or of clay. We transform gold into glass, and who can doubt but we might reciprocally convert glass into gold? All submit to our commands. We are the true kings of the earth, since every thing thereon complies with our desires; and our having recourse to notorious examples in order to make this good, is, because it would be the utmost imprudence in us to

(a) A mass of sulphur and of quick-silver mixed either by nature or artificially.

profane the mysteries of our art, by communicating them to the people, or by exposing them to the banter of miscreant minds. All we can say in favour of the noble souls, whom men endeavour to dishearten, is, that all the doctrine of our father Hermes Trismegistus is contained in the metamorphoses of Proteus, a noble emblem of the primitive matter (*a*). There is an universal nature indifferent to all sorts of forms, capable of retaining them all, and which by turns becomes sulphur or phlogistick salt, mercury, pewter, silver, gold, and whatever we are pleased to prescribe to it. There are two methods of arriving at the end proposed: One is to employ the stone composed of the three tinctures which have been extracted from the mercury, the sun, and the moon, and which we call the solari-lunari-mercurial-tri-unity. The other method consists in knowing the use of sulphur, salt, and mercury. With these three principles, which of all are those that take us least out of sight of the primitive matter, we shall construct the whole universe, since in order to diversify the parts of it, or to form different species, we need only to know how to vary with discernment the matrices into which these principles are received. But we have said too much. These would certainly be very great hints to such as should be willing to make their advantage of them; and the men to whom we offer so favourable a hand to fetch them out of their misery are indeed very inexcusable.

The PRINCIPLES of the ALCHYMISTS.

(*a*) These notions of the primitive matter came into the head of the Egyptian doctors, after they had long studied to find out what the signification of their Proteus might be. But the ancient Proteus, by his name and several changes, was the

proclamation of the exchange of the corn, and of the fruits of Egypt, for the commodities in the foreign ships. This philosophy suited the Egyptian nation much better than the primitive matter.

There is much pomp, a great outside of confidence, and very fine promises, in all this discourse, as well as in that of most of the partisans of the philosopher's stone : but I may be allowed to examine into the meaning and effects.

First, we may with justice complain of their mysterious obscurity. If they have so affectionate a charity for mankind, what makes them use so much circumspection ? That croud of enigmatical receipts and unintelligible writings wherewith they pester us, give a very disadvantageous idea of their persons and learning. Why do they hide from us what can make us happy ? It is either cruelty or shallowness of understanding. Why do they give us hints which they would not have us take ? Silence no doubt was much simpler than obscure writings. It must be owned however, that all is not equally obscure ; and we shall here insist only upon what is clear in them.

Metals can
neither be
destroyed
nor revived.

Alchymists very plainly boast of destroying and reviving metals. But they impose upon us in both these respects. 1. They do not destroy them. If after having dissolved a leaf of silver in aqua-fortis, you put therein one of iron ; the inward fire or spring which renders the aqua-fortis fluid, as it does every other liquor, together with the vitriolick particles which constitute the whole force of this water, have, after the separation of the particles of the silver a sufficient degree of activity left, to divide likewise the minute masses of the iron, but not enough to keep the particles of iron and those of silver in a state of fusion at the same time. The aqua-fortis therefore abandons the silver, whose small masses are not so easily attenuated as those of the iron ; and all the silver dissolved sinks to the bottom of the vessel, resembling a mass of slime by the ash-colour it then assumes, though it be
silver

silver in reality. The iron dissolved and attenuated will likewise be made to sink, by putting a small quantity of calamine into the water that divides it. But the metal dissolved and put in a state of fusion by these operations, is not dead. Not even one grain of it is lost, destroyed, or changed; since the aqua-fortis, by loading itself with the weight of another metal, at the same time, disburthens itself of the whole mass of the first, and faithfully returns you the totality of it. If the metal dissolved is not destroyed, precipitating it to the bottom of the glass, as was just said, and putting it into a mass again by fire, is by no means reviving that metal. He cannot be raised from the dead who is neither dead nor altered. What has then happened in these different states which successively take from and return to us the sight of one and the same metal? All we are to say is this; that what was invisible in the dissolution by the very great attenuation or division of the particles, begins to affect our senses when these dispersed particles of the metal draw near each other again. And it is proper here to observe, that a dissolution of silver will never return you any thing but silver at the bottom of the vessel after the introduction of the iron therein; and that a dissolution of iron will likewise return you nothing but a mass of ferruginous particles, after the introduction of the calamine. If we are able with certainty to foretel what kind of metal shall sink to the bottom of the vessel, it is because we know beforehand that such or such a metal resides in the sharp liquor, in which it is invisible on account of its prodigious attenuation.

The other destructions and revivings so much cried up by the alchymists, have no greater reality in them. Lead may be calcined, and thereby
F 2
redde,

redde[n], become minium or vermilion, be pulverized, and enter into the composition of varnishes and paints. It may again be half dissolved over the steam of hot vinegar, whiten, and become ceruse. But it changes in colour and name only. It continues to be in reality all it was before it became red by calcination, or white by the second operation mentioned. This may easily be proved. Take with a small pair of tongs either a piece of ceruse, or some sealing wafers coloured with minium. Offer them to the flame of a wax-candle, receiving on a paper the ashes that drop from them. You will perceive among these ashes a number of threads of melted lead. An ordinary magnifying glass will make you easily discern them, by help of their brightness among the ashes proceeding from the flower of the wafers, or from the chalk which is added to common ceruse. The lead therefore had only changed its colour therein, without losing any thing of its nature. It constantly remains what it was at first, and you are sure to find it there again whenever you please. Nothing but lead can be fetched out of minium or ceruse; and the aqua-fortis which has dissolved iron, will never by precipitation return you either gold or pewter; a complete proof indeed of the immortality of the iron, which after the dissolution ceased not to be iron, and which by its precipitation assumes not indeed a new life, but another place only.

Alchymists, who so unjustly boast of a full power of life and death over metals, with as little reason pretend to transmute them at their pleasure. The vermilion or pounded cinoper which they throw into the crucible with a quantity of silver in grains, is there penetrated, and has all its pores filled with silver. This indeed is true: but that increase of the mass enriches the eye only, by an apparent augmentation

mentation of the metal. The quick-silver which makes above two-thirds of the cinoper, is divided and subtilized by the fire, and vanishes at last. On the other hand, the silver acquiring a state of fusion gets out of the grains, of which there remains nothing but the outward pellicle. It insinuates itself into the vacuities of the cinoper, and there takes the place of the quick-silver, which evaporates. If any change happens as in the precipitation, it is only a mere change of place, and not a farthing-worth of advantage. Far from it, since you lose both your cinoper and your coals into the bargain.

*The PRIN-
CIPLES of
the ALCHY-
MISTS.*

A few years ago, there rose near Paris, that is, in the neighbourhood of all sciences, a kind of manufacture, which promised considerable benefit, to be reaped by the transmutation of iron into copper, and revived the superannuated hopes of transmuting copper into gold. As the copper which came out of this laboratory had, they said, undoubtedly been iron, it was proper to give it a name that might at once express its first and second state. This gave birth to the ingenious magnificent name of *transmetal*. The whole city of Paris, attentive to this wonderful metamorphosis, thought they saw the iron destroyed in reality by it: and indeed this operation produced a good-conditioned copper. But the iron which they caused to disappear by dissolving it in the vitriolick water, ceased not one moment to be iron; and the copper collected in the form of the bottom of a church-lamp, was not more perfectly copper in this operation, than when it was secretly introduced into it by means of the blue vitriol which is quite full of that metal, and which served to make the dissolution of the iron. No iron was any longer seen, though not one grain of it was lost. Nor was any copper in appearance introduced into the working, though they together

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with the blue vitriol threw into the dissolving water all the copper which was afterwards found. The undertaker after having duped a number of people by an appearance of transmutation and profit, disappeared on a sudden with both the money and hopes of the parties concerned.

As to the confection so much cried up of real iron by the union of clay and lin-seed oil, it having been promised to the public by a man (a) to whom his post, learning and candor procured respect; the public had some disposition to hear the history of it. It awakened all the alchymists, even those whom the loss of their lungs and fortunes had discouraged most. Great news! very great news! said they to each other. Iron is made of what was no iron at all! It is matter of fact. Whoever makes iron may entertain hopes of arriving to the making of copper. Let us not be disheartened. One step farther, and gold is obtained. By misfortune the making of that iron was as ancient as the world itself. It resided in the clay, but was imperceptible there; and the lin-seed oil seconded by the action of the fire having served to unveil it, men fancied that this oil was the principle thereof, and ingendered iron in conjunction with the clay. Mr. Lemeris, who held the negative, and pretended that the iron was not produced, but resided there before, had indeed truth on his side. But Mr. Geoffroi, who yielded to the truth by owning his mistake, is undeniably of the two academicians the man to whom this dispute did most honour.

It will perhaps appear difficult to conceive how this iron came to reside in the clay, and how the lin-seed oil was able to fetch it out of it. It is notorious that unctuous juices assist the re-union

(a) Mr. Geoffroi the elder, of the academy of sciences, 1707.

of the particles of metals, and render them malleable. The lin-feed oil can as well clean and fetch off the rust of the particles of iron, as it can bring them again near each other ; infomuch, that these particles, which in their rust and state of dispersion were imperceptible, invifible, and according to experience unmoved at the approach of the load-stone ; being in this oil divided from the falts, earths, and water, which made them rusty, will contract a motion, and fenfibly come and ftick to a knife touched with the load-ftone that fhall be prefented to them, and may by fufion re-unite and form a mafs.

The PRINCIPLES of the ALCHYMISTS.

But what can be the agent which brought thefe ferruginous particles into the clay ? There is almoft no earth but what water will penetrate more or lefs, and through which it cannot by degrees make its way, together with the feveral principles it carries with it. But the clay bars its paffage. Therefore the water leaves upon the clay the heaviest parts of what it is charged with. But how ! Can water poffibly carry with it iron ? Of this we are perfectly inftructed by experience, without beftowing any attention upon it. Iron, which is fo abundant, and by its inky tafte fo fenfible in the waters which we call ferruginous, is not lefs real in the other water-ftreams wherein it runs in a quantity too fmall to affect our fenfes. Iron is from one end of the globe to the other difperfed in the bowels of the earth for the fervice of man ; and the water on the other hand almoft every-where wafhes off and carries away with it fmall particles of this metal, perhaps to do us neceffary fervices, though we are little or not at all acquainted with that neceffity.

Water introduces with it into the body of the plants, and into that of animals, an infinite number

Sufpicions upon the ufeleffnefs of iron in plants

ber of small particles of iron, as it likewise introduces globules of air, minute drops of oil, laminæ of salt, and other principles therein. I will not say that this iron is designed to give the bark and wood the stiffness and firmness which the iron bars give the materials we use in the building of our edifices. Nor will I say, that the particles of the iron are masses necessary or at least useful in vegetations, and in living bodies, to open the passages obstructed. This mechanism is not unworthy the wisdom of the Creator ; and it is this way that mineral waters are commonly beneficial, in helping by their weight to clear obstructions. Our suspicion as to this point is strengthened by the sight of those little masses of iron, and of very hard flints, which are most commonly found in the gizzards of domestick fowls, and many other animals. But, though we dare not assert any thing in a special manner concerning these uses of the iron which are not known to us by a sufficient number of experiments, we may however boldly affirm, that iron is useful and necessary every where, because God has dispersed it, and we in reality find it again every where. I don't pretend that there are mines and large masses of iron in every place. These treasures are peculiar to certain provinces. But iron circulates every where. It is dispersed both in the plants wherein the sap flows, and in the bowels of the earth, wherein water runs and winds about. This is a fact testified by the load-stone. You seldom present it, or in its stead a knife touched with it, either to the ashes proceeding from wood, or to those of the flesh, hairs, and blood of animals, but particles of iron come and stick to it. The knife often is bristling with them. The same water which had insinuated these ferruginous particles into the body of the plants and animals,

animals, in a long sequel of years carries and amasses them in the bottom of an exhausted mine, into which I suppose they may have again thrown the vitrifications, the dross of iron, and all the refuse of the furnaces and forges. There may possibly remain in these wastes a few parcels of metal, which being joined with some others newly brought and introduced there by the current of the water, will possibly contribute one day or other to a second fusion. But the masters of the forges, who fill their ditches with this dross, and after twenty or thirty years again find a small quantity of new iron there, are a little too hasty in thanking themselves for their prudence, and attribute to nature a coction which is purely ideal, or a transmutation of these vitrified drosses, which has no reality in it. Neither the sands nor the earths assume a new form here, nor does the sun digest and concoct them. The water always running about the mines, evidently may feed them in this manner. It is this water which by degrees brings thither some new grains of metal. This water in short washes off and carries away the iron from a higher place, to deposit it upon a lower, where it resided not. It enriches one place at the expence of another, just as it carries away the gold-dust, and from the bottom of the mines throws it upon the shores of so many rivers.

Water oftentimes carries off under-ground a few parcels of silver or gold, amidst those of another more abundant metal. The waters which saturate themselves with the vitriolick salts become dissolvent ; in which case they leave and suffer a dissolved metal to sink to the bottom, when they happen to be loaded with the dissolution of another metal. On this account it is impossible not to find a considerable mixture of metals among the fossils. But this

The PRINCIPLES of the ALCHYMISTS.

The mixture of metals under ground.

this mixture does not authorize us to think that there is any new formation, digestion, or transmutation in the case. Much less is it an occasion to think, as the alchymists do, that the pewter, in which a few parcels of silver are found, is one-half metal, a metal imperfect, and silver begun : or that silver is in the earth the sketch, the beginning, or the preparation of gold.

The rivers which run into the Rhine, from the grounds carry thither a few minute particles of gold, which in a long series of years descend in small platoons into the sands that border Holland through the mouths of the Iffel, the little Rhine, and of the Maes, swelled with the waters of the Lek and the Vahal. Glauber having extracted a few of these golden particles from the sands of the Rhine, and Beker from the sands of the German sea, imagined that they had the art of creating that metal, or of converting into gold a sand which there was certainly no gold in. But if the fire, the sulphur, the borax, or other unctuous salts which they added to the sand in their furnaces, sometimes procured them half a dram of gold from two or three hundred pounds weight of sand, and most commonly nothing at all ; was such a trifle a reason for them to set up for transmutators, and to promise a true and real manufacture of gold to such as would contribute to the charges of the furnaces ? They found gold, because the matters they used were capable of connecting the dispersed particles of that metal. But these matters were not the forming principles of it. These pretended principles formed nothing, and by a perpetual inequality disappointed the hopes of the operator, where-ever there was but little or no pre-existent gold at all. The inequality of the products was exactly the same as that of the profits which certain peasants make, who look out for gold-

gold-dust upon the banks of the river Cese, Arri-
 ege, or Rhine. They get ten-pence, a half-pen-
 ny, a pistole, or nothing at all a day, according
 as the water of the river brings them much, little,
 or nothing at all of this gold-dust which the stream
 carries with it.

The PRIN-
 CIPLES of
 the ALCHY-
 MISTS.

All these examples concur to prove, that water
 is the universal vehicle which God has appointed
 for the use of man, to bring and carry every thing
 to him upon the face, and through the bowels of
 the earth. Therefore when we find iron particles
 in the cavities of the clay, and by the assistance of
 fire and certain oils arrive at fetching out the ferru-
 ginous particles that were imprisoned in this earth,
 it is easy to see that this iron was brought thi-
 ther by the current of the waters, and that its being
 insensibly there on account of an excessive attenua-
 tion, proceeds from its having been dissolved, and
 prodigiously divided by vitriolick waters. This
 may be conceived. Universal experience is agree-
 able to this; and to pretend that this iron is
 a sudden production of mixing the oil with the
 clay, would indeed be espousing the worst of sy-
 stems. We might otherwise have just reason to say,
 that after heavy rains have washed the streets of
 a large town, when the poor go and look out for
 a few old pieces of iron, or of money carried
 down by the rapidity of the stream, and stopt
 in the cavities of the kennels, that these pieces of
 iron or of money are a sudden product of the gravel
 out of which they are fetched, and of the stick
 which makes them visible.

Examina-
 tion of the
 transmuta-

If the conversion of clay into iron has little of
 reality in it, the transmutation of gold into glass
 has not a whit more. Mr. Homberg, 'tis true,
 thought he saw the gold he offered to the focus
 of the burning-glass at the *Palais Royal*, melt, and

tion of
 gold into
 glass.

Memoirs
 of the aca-
 demy

1702, and
 after- 1707.

* Mem. of
the Acad.
1711.

afterwards become glafs. But if we had a right to except againſt ſuch a testimony as that of the illuſtrious *Mariotte* upon colours, we are ſurely intitled to examine that of Mr. Homberg upon the vitrification of gold. This chymiſt was but too fond of the opinion, that all natures, even the moſt ſimple, are reciprocally commutable: witneſs thoſe long and toiſome operations he with no leſs credulity than patience has made upon a matter whoſe ſmell was never reputed perfume. A perſon of note, either out of jeſt, or a ſincere perſuaſion, had given him to underſtand, that by a long baking of the above matter, he would inſure to himſelf a white and not fetid oil, a mighty extract which had the property of fixing, or of converting mercury into ſilver. This hiſtory we had from himſelf*. That the matter might be laudable, he brought down into the country four ſtout vigorous porters, whom he fed very well. He for three months together gave them the fineſt bread, and made them drink the beſt champaign. As a prudent man, he would have nothing to reproach himſelf with, and neglected no circumſtance that might contribute to the perfection of the *Oleum mirabile*. But his extract baked and rebaked many times over, procured him nothing but a black duſt, which by being ſo often paſſed through the fire, became ſo full of this element, that it took fire at the leaſt impreſſion of the air, ſo that Mr. Homberg thought he had found a new phoſphorus, that is, a new philoſophical match, whoſe light made him ſee in the dark what o'clock it was by his watch. Such was the benefit of his large expences, and upwards of a year's loathings. But the ſorrows and diſtreſſes of the undertakers of *transmutation*, are not always repaid by the acquiſition of ſo fine a light.

This

This phosphorus, though it was but a slender recompence, yet flattered Mr. Homberg. But he was above all pleased with another operation, in which he thought he had found a real conversion of substance. This was the vitrification of gold in the focus of the burning-glass. At last, said he, here is a substance changed by fire into another essentially different. Our hopes are not lost: there are transmutations in nature. But that which pleased him so much, in hopes of the reciprocal conversion of glass into gold, was very far from being real. The action of the fire, which is terrible at the focus of that large glass, occasioned a small addition of matter to the gold there presented, by rapidly uniting therewith the dust, salts, hairs, and fine sands flying in the air, and those which happened to be upon the instrument which supported the gold, blending the whole together. If the gold was immediately vitrified, it is because being in a very small quantity, it might be absorbed under a vitrification of saline corpuscles. But it was not destroyed for all that, and ceased no more to be gold than that which is found in the lapis-lazuli; as the copper ceases not to be copper in the avanturine, or the iron to be iron, when wrapt up in a piece of ice, or in a mass of sand, by the fire of the forges vitrified.

But what renders Mr. Homberg's vitrification very suspicious, if not of falsity, at least of measures ill taken, is its being absolutely personal to him. It has never appeared since. It was attempted with great accuracy at the landgrave of Hesse-Cassel's*, and in other places, with burning-glasses * See Mr. still larger and as well made as that of the Palais Royal, but always in vain. The melted gold has still continued to be gold. Even lead has either wholly evaporated or preserved its nature there; and

The PRINCIPLES of the ALCHEMISTS.

Hartfoc-ker's physics.

and both from well-known experiments, and the several confessions of our most judicious chymists, it is known, that the elements, whether celestial as fire and air; or terrestrial as water, sand, salt, earth, quick-silver and metals, are so many matters primitively made, and designed for certain effects, incorruptible with regard to us, and durable to ages.

But I am perhaps too full of the thought; that God has at first determined the quantity of the metals which men should stand in need of: that they are substances every whit as simple, elementary, and incommutable, as water, sand, and ashes: that our provisions are consequently made: that we never shall produce the least grain of metal: that our skill consists in amassing together or working the metals already made; but that we never were indowed with a capacity of producing them. Though this thought, if approved, might shut the door against many frivolous hopes, and ruinous operations; let us not however admit it out of interested views. Let experience alone and the truth of facts persuade us to espouse this principle.

But are not facts here evidently against me? Almost every-where about the mines, and in mineral matters, we commonly meet with sulphur, cinoper, marcasites, vitriol, and other matters, wherein much metal is already found. These being not perfect metals, have we not reason to think that they are metals begun? Nature here shews us the way we are to follow. She offers us matters which want only the finishing stroke to become metals in reality. She invites us to the working of these precious substances, by pointing out the forming principles of them to us.

A way of arguing like this would be a very gross mistake indeed. Let us again demolish this
false

false pretension, so very common, by such facts as cannot be excepted against. The cinoper is a compound of mercury and sulphur. The sulphur is composed of oil, and of acid vitriolick salt. The oil is composed of fire, air, water, salt, and of an unknown matter, which is the case and bond of the whole. The vitriol is composed of saline and of metallick particles. If this salt touches iron, it is a green and ferruginous vitriol fit to make ink with : if it unites with copper, it is blue vitriol fit to make dissolving waters. All these matters are more composed than the metals. For they not only may be fined and cleansed, but most of them may be analyzed, and even some be again compounded. Whereas metals, which may indeed be purified, can never be analyzed. All these matters which contain much metal in them, together with other substances, do not form the metals, but rather are formed by them. It is then no wonder that we find them in the neighbourhood of the mines. Therefore antimony may owe its birth to an intimate mixture of mineral matters ; but it never will give birth to so simple a substance as gold is. This antimony prepared may become *Regulus*, and in the opinion of the alchymist pass for the Dolphin, or the *Petit Roy*. But the *Regulus* was never seen to become king. It will never be gold but in idea and expectation.

The clearing of this question being of the utmost importance, and capable of curing men of the extravagance of incroaching as they do upon the prerogatives of the creator, let us reject with disdain none of the arguments of the alchymists before we have examined them. That which pleases them most, though it be the least acceptable at bottom, is their fancy, that the egg of a bird or of another animal is nothing but a mass of primitive matter, without

The PRINCIPLES of the ALCHYMISTS.

without vessels and lineaments, which being taken from the ovarium, and conveyed into the matrix, there assumes its peculiar form and structure; and that the sulphur and mercury will in the same manner assume the form of pewter, silver, or gold, according to the variety of the matrices they are received into.

Here are fine words indeed, and an outside of philosophy. But in good truth, all this signifies nothing. What relation is there between the germen of organized bodies, and bodies that have no organs? Bodies organized have vessels, a shape, a constant birth, which never varies in the same species. But this wonderful organization is not at all the work of the matrix into which the germen taken off from the ovarium is introduced. The matrix preserves this germen: it nourishes, it unfolds therein a body already formed by the hand of the Creator. Matter may therefore, without forming the germen, yet be necessary to its growth, and for a while keep the extreme tenderness of the embryo free from all insults. But there is no manner of comparison between these so very wise precautions, and the formation of a mass of gold or of marble. The particles of these masses are made from the beginning. But the mass may be attenuated or made thicker, according to the motions which divide or reunite the dispersed particles of them. These bodies are formed by small grains, by thicker balls, by large beds, sometimes smooth, sometimes broken and mixed. Who, in these fortuitous conjunctions, cannot recognize the operation of water, which has carried and heaped up the matters thereof, according to the cavities, levels and declivities it has met with? It has gathered them in veins where-ever it was able freely to run through a certain extent and space. But
the

the masses it has united are mingled or fractured according to the confusion caused among them by the fire, the air, the concussions of the earth, and the stream of dissolving waters. What I here advance is confirmed by the regularity of the figures which the small streams of metallick and stony particles assume under-ground, according to the variety of the moulds into which they are received. We most commonly find bits of wood, which after they were rotten, have been penetrated with a crystalline matter, so as to become stones, or flints, or true agates, without losing in the least the primitive order of the fibres of the wood. The crystalline juice drives away or absorbs the substance of the worms, which had perforated these bits of rotten wood. It intirely takes up the room of them. But the visible vestiges of these worms through the whole thickness of the wood, are proofs that this wood has been altered, and that it is the rotting or the evaporation of a multitude of solid particles, which facilitated the access and insinuation of the stony juice. I have a piece of a vine-prop petrified that was found in a vineyard. I have an acorn totally converted into stone. Nothing is so common as to find under-ground masses of stony juices, which have exactly filled the shell either of a sea-urchin, or of a nautilus called the horn of Ammon, and which exactly preserves the figure of the mould, though the said shell, which was very thin, be destroyed either wholly or in part: So that the collections more or less considerable of these stony juices, or of the metallick particles, may be the work of the agents which God has appointed to spread the use of these matters in a greater number of places. But the minute parcels which compose those collections, are elements known to God only, and designed for our service from the beginning. They are indestructi-

ble ; that the world may remain constantly the same. Now, if it is not in our power to destroy them, either by dissolvent waters, or by the force of fire ; much less is there any power capable of producing them. Therefore all metals are ready made, and undertaking to form a single grain of gold, is attempting to make an element. It is undertaking to make the world.

This question deserves to be examined to the bottom, philosophers will say. But it is time to get out of the cave of your alchymist. It is not of elements like sulphur, salt, and mercury, that we intend to construct the world. Leave all these old chymists, and give them over to the extravagant hopes they build upon the metamorphoses of their universal spirit. Are people of this stamp to be confuted seriously ? They are mere quacks, who promise others riches, and whole ages of life, while they themselves perish in misery, and none of them, for the honour of their profession at least, has as yet been found applying to his own benefit the restorative or universal elixir, which they so emphatically offer to others. Or if their researches are serious, they are at most a parcel of unskilful artificers, who have nothing but hands, and are not born to think ; since it has been ever impossible to make good their promises, and to understand anything of what they say. Come to us : we intend to propose to you none but clear ideas ; nay, we shall warn you beforehand not to give credit to any thing we say, but as our principles shall appear to you rational, and attended with evidence. 'Tis true, there is a great variety of opinions among us : but this very division has something in it advantageous for you, since it occasions a very material examination. You become judge of our debates, and nothing but light and evidence will

will prompt you to espouse any party preferably to another.

The PRINCIPLES of the known COMPOSITIONS.

III.

The principles of the known compositions.

A M O N G this multitude of philosophers who invite us to study with some constancy their systems both upon the origine and the structure of the heavens and the earth, it is proper we should pick out the most famous of them; and most particularly Democritus, Epicurus, Lucretius, Aristotle, the schoolmen, Gassendus and Descartes. I observe in all of them a meditative air, and an outside of profound recollection. All have been fond of solitude and silence. It seems at first that none but a good opinion can be entertained of what a serious examination and a long habit of reasoning will produce. But a suspicion, or a motive of distrust naturally grounded upon their gloomy disposition, and upon this method of meditating rather than seeing, seizes me on a sudden.

Democritus had retired into the tombs of Abdera; and wished himself blind, that he might think with greater freedom, and without any absence of mind, to order the world he had in his head: Epicurus knew nothing but his gardens. The study of the particulars of nature, and the toil of experimental researches, would have offended his indolence. The Platonics, Peripatetics, and Scholastics, ever have despised particular studies. They left them to the artificers, in order to busy themselves about metaphysics and disputes. Descartes and many others shut up by themselves, and always amused about generalities, hardly knew any thing but their own thoughts, and hardly

The defect of the method of philosophers.

vouchsafed to study nature herself. If a disposition like this clashes with reason when the structure of the world is to be decided, it would be no less imprudent in us, when we are to compare their systems with the universe, of which they all pretend to explain the frame. I certainly have a great value for the beauty of their genius, and the noble order and series of their thoughts. But these being so very different among themselves, I ought on this account to mistrust them, and to set no value either on their notions or mine, but in proportion as they shall prove agreeable to experience.

Let us then begin by consulting experience rather than any argument. Let us collect a good number of facts, whereby we may be enabled rightly to judge of what philosophers shall tell us, and equally to avoid approving or blaming any thing rashly. Let us examine the particularity of what happens in the daily changes which are made around us. What we shall see either constantly or never at all in these operations, will authorize us to pass a reasonable judgment upon the possibility or impossibility of the transmutation of an universal matter into a regular world. For what disagreement soever there may be in them, they nevertheless all unite in this common notion. But their chaos becoming a world, or their world built with an homogeneous (*a*) matter, ought to appear to us a plausible work, in proportion only to its being exactly agreeable to the true world, such as it is perceived by our eyes and our hands.

Three
kinds of
bodies.

We observe about us three different kinds of bodies: 1. Organized bodies: 2. Compound bodies: 3. Simple bodies, or those in which we perceive no manner of composition. The first, like the body

(*a*) Wholly of one and the same kind.

of

of man, of an animal or a plant, spring from a germen, in which they resided in little : they increase, thrive, come to perfection, and finally are destroyed by the dissolution of the several parts that composed them. The second kind of bodies, like the major part of minerals, stones, and other fossils, do not proceed from any germen, but are formed of many more or less simple bodies drawn near each other, and gathered in a mass. The third kind, like refined metals, water, sand, light, and many others, are bodies which I think I may call simple ; because they enter into the composition of the foregoing, whereas there is no other ulterior kind of body that enters into the structure of these. This is what I take to be the result of experience ; and upon this the discussion of all the assertions of philosophers depends.

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They say, that water, salt, sand, common earth, fire, air, and other principles, become for instance sap ; that sap becomes fruit ; that fruit flesh ; that flesh ashes ; those ashes become a plant, a flower or fruit ; that fruit again becomes flesh, vapour, rain, grass, &c. This is a circulation of transmutations always new. The increases, dissolutions, mixtures, alterations and changes of all kinds happen either in the organized bodies, or in such as are mixed. But there appears in the bodies which we call simple, no other real change than that of the greater or less quantity.

This increase or diminution of the quantity being no way related to, and altering nothing in the nature of things, if there are such simple bodies as those we just said there seemed to us to be, we may look upon them as elements designed for the framing of the other bodies. If the water, the earth, or the iron, which enter into a plant, there preserve their nature in its full perfection, and are found again after

the dissolution of the plant to be all that they were before they entered it, we shall be able to assign in nature the cause of the meeting of the matters, which occasion the increase of this plant, and likewise to refer the causes of its nutrition to heat, salt, oil, and water. But who shall be able to assign the cause of water in nature? They must likewise be able to shew us under-ground the cause of certain concurrences or mixtures of matter. Nor need they have recourse to God's will, to tell us the cause which produced a mass of cinoper; since it is known that this mass is a mixture of sulphur and quick-silver. But to what cause shall we refer the formation of the quick-silver? You make it evaporate in a recipient: you fix it, and then think you have destroyed, transmuted, or lost it in several mixtures. It shews itself again after twenty different operations: again, it appears liquid, sound, and intire; in short so constantly the same, that a skilful German chymist, struck with the immutability of this nature, thought it a good conceit, when he said, that a hundred tortures could not extort from quick-silver its dying confession. But if it cannot be altered, who shall be able to produce it? It is the same with ashes and dead earth. After a thousand mixtures, you find it intire again. No agent is able to form it. You find it where it is; but no cause is capable of producing a grain of earth. Let us, by repeated experiments, make ourselves certain whether there are or are not round us several bodies of the same simplicity, that is, which we can neither change nor annihilate, or revive. The benefit we may reap from such a discovery is this;

We find all the animals and plants of a certain determined form, which is invariably the same; so that when by chance a monster happens to appear,

pear, that monster cannot perpetuate its kind, and introduce a new genus into the universe. God, by this means, has shewn upon earth a wonderful variety of organized bodies : but at the same time he has limited their number. Nor shall any action or concurrence imaginable add a new genus of plant or animal to those of which he has created the *germina*, and determined the form. God has likewise created a precise number of simple matters, or of elements essentially different among themselves, and invariably the same, to assist the increase of organized bodies, and the allay of the mixed ones. By the diversity of these elements, he varies the scene of the universe. But he prevents the destruction of that universe by the very immutability of the nature and number of these elements. He sets bounds to the alterations which appear in them ; so that the world is for ever changed, and yet the same for ever.

If I attempt to search into the origine of these organized germina and different elements, and to find a physical cause productive of them, I am still in the dark. But if I refer the origine of either of these kinds of bodies to a certain design ; I easily perceive, that he who has appointed them to be of service throughout all ages, has rendered their different usefulnesses infallible, by the impossibility either of destroying or adding any thing to them.

This thought is no way injurious or disgraceful to God. I on the contrary find in it the character of his power, which is invariably obeyed ; of his wisdom, which has abundantly provided for every thing ; and of his tender kindness towards man, for whom he has by that means prepared services equally various and infallible. As I have with the utmost satisfaction already observed, that God has organized the sun, to supply the earth with the

portion of light, colours, and heat it stood in need of; and that he has wonderfully organized the earth in favour of its appointed inhabitant; it would be an additional conviction to me of the excellency of my own condition, and of the cares of a providence that deigns to busy herself about me, if I saw coming out of her bountiful hands a provision of elements all placed within my reach, charged each of them with a useful ministry towards me, and all of them shaped with so much art and solidity notwithstanding their fineness, that no power whatever might be able to break off the least piece, to imitate the structure, or interrupt the services of them.

Were this thought as true as it is magnificent and honourable to man, it would be very proper to affect his mind, and to shew him every where the bountiful hand of his Creator. Another very important consequence would result from it, viz. That, as the body of man, the body of the earth, and that of the sun, cannot have received their magnificent organization from any physical cause, but have it immediately from God himself, who alone knew the structure of them, and would have it so; we ought to say just the same with regard to the origine of the fire, the light, the water, of the minutest grain of gold or of iron, and of all the matters which we see invariably persevering in their primitive state.

By a necessary consequence we shall be obliged to own, that as that particular will of God which has constructed the body of the elephant, is different from the design which has assigned to the horse his peculiar form, and another express will of God would have been necessary to augment the number of the animals of a single genus not now among them; it is a peculiar will likewise that has made
gold,

gold, and by its rarity rendered it so precious ; and another will again that has made iron, and dispersed it every-where, because its usefulness extends to every thing. We shall be moreover obliged to say, that no motion or any second cause can possibly have formed iron or gold, because if any natural agent could make these metals, it might also render common that which is rare : it might produce one-ninth or a twelfth metal unknown, and altogether different from those we know. The world would now be quite different from what it was yesterday : and far from being preserved, it would at last be destroyed.

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If there are about us any such simple natures actually incorruptible, this excellence of theirs leads us to a special design of the Creator ; and from that moment the physicks of the ancients and moderns who pretend to see every thing springing out of a vague matter moved in a direct, oblique, or circular line, is intirely demolished. These physicks have already proved abortive, when they were to account for the formation of the minutest worm. Men are now out of conceit with the possibility of the generation of insects through corruption, or by the motion of a few separated bodies. Nor shall it be long before we put this important question in a fairer light, in favour of the young people who have not yet examined into it. If these creating physicks again fall to the ground when a drop of water or a grain of gold is to be produced, how will our philosophers have the assurance to pretend to fetch out of the chaos, and by the assistance of simple motion, a heaven all over sparkling with stars, a sun dispenser of life and beauty, an earth full of provisions, which were never seen to be destroyed or altered ? Let us then with great care pursue particular experiments. Methinks I find in them

them this : *viz.* that we have at our disposal or at our service a multitude of simple substances, which no motion or concurrence of causes whatever is capable of forming, augmenting, diminishing, or in the least of altering. The same causes which would have been able to give them birth, might also destroy them, or produce others of quite a new kind ; and if there are unalterable natures, they have as well received their peculiar existence and their immutability from a special and immutable will of God ; as the animals and plants are indebted for their peculiar form to an infallible will, which no agent is able either to counterfeit or improve. In short, the increases and mixtures excepted, which may be differently regulated by transitory motions, the design and will of God shall be the only physical cause of the general œconomy of the world ; the only physical cause of each organized germen that thrives in it ; the only physical cause of each of the very minutest elementary particles which enter into the composition of all.

The inde-
fectibility
of fire.

★ *Speçt de
la Nat.*

Vol. IV.

part 1.

dialog. 11.

ç. 12.

Let us begin with the examination of fire. We have in the *Speçtacle de la Nature* * collected a multitude of trials upon this element, which conspire to make it evident that fire may very well have many different natural causes of its increase, but that it has no physical cause of its existence. We may take it where it is, collect it, draw its particles near each other, and animate the whole. Thus we light fire, but cannot produce it. We may likewise scatter here and there, and let loose this fugitive element : but we put it out without destroying it ; and when we think we annihilate it in the coals, or in a burning log, by pouring water upon it, it is wholly inclosed in the smoke, which then rises and burns our face or our hands.

Fire

Fire seems then to be at our command, but is no product of ours. We shall no longer ascribe the production of it to ourselves, when experience shews us a number of other elementary substances, which seem, like fire, to perish, and be revived again, or even to be metamorphosed into other natures ; but which in reality subsist constantly the same, and are equally ingenerable and indestructible.

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The first substance we meet about the fire is the light. This immense element, which is the bond and ornament of all the parts of the universe, varies its impressions only. It is actually what it was six thousand years ago, and indeed what cause could be capable of altering it? Endeavour the destruction of the least particle of light. What instrument will you lay hold of it with? It will go through them all. The hardest body, even diamond itself, is a downright sieve to it. It may, 'tis true, by the several bendings it contracts in the different laminæ of a mixt body, lose the direction of its motion, and be no longer felt. The perpetual weakening of the impulsion it had received from the sun or a wax-candle, possibly will put it again in the state of its ordinary equilibrium, and being no longer agitated, it will of course no longer affect the eye. But the substance of this admirable element is constantly the same, whether it be unactive and without impulsion about us, or repeats its services in proportion to the vibrations that push it upon our eyes. It is as real and as nearly about us at midnight as at noon ; the minutest particle of fire striking against the body of this light, betrays its presence to us.

But it will perhaps be otherwise with one single part than with the whole body of light itself. Since a prism can divide the parts of that light, make us discern the red from the yellow, and put each colour

lour singly before our eyes ; let us try our efforts upon one single part. We shall perhaps find less difficulty in one single colour. Possibly it may resist less than the whole. The numerous experiments made by Sir Isaac Newton, have let us into the truth of this matter.

The red ray which we would attack being through a small aperture received upon a glass, gives us a red spot. This light reflected from the glass, and received through a blue lens, that is, one which admits the blue rays more easily than the rest, yet finds proper passages through it, and it arrives red upon the opposite wall. Now, let us strain it through another prism. But there are no more divisions to be made or hoped for by the diversity of the refractions. This light is only red ; and neither shall two or three new prisms that successively refract it, nor two or three glasses that reflect it anew, ever be able to give you any other colour than red. The ray possibly shall be weakened as to its quantity, because it is differently reflected and refracted at each new surface. But it carries its redness every where with it, and receives it from no disposition of the bodies, whatever you may be pleased to imagine it to be. It will not cease to appear red, till it ceases to remain alone, and joins to the common mass appointed to form the white or the splendor of the day by the reunion of all the essential colours.

Let men, after this, give us systems upon the productive causes of the light. To determine learnedly, that a hard or a soft particle, one round or one divided in the manner of a vortex, is able to produce light, we should previously know what light is. But the task would be too hard. I only would be told what a red ray is, and why that red attacked with twenty instruments at once proves indestructible?

deſtructive? All we are told about this matter is neither conceivable nor agreeable to phænomena. But we eaſily conceive, and experience tells us, that light, as well as each of its colours, are natures as immutable as the will that made them. There is then no ſenſe, but great temerity, in looking out for the productive cauſe of this luminous ſubſtance, or of a red ray, any where elſe than in the efficacious deſigns of him who ordered the light to be, to enlighten man, and ſpread upon objects ſuch differences as might enable him to diſtinguiſh them immediately. This phyſicks is intelligible; nor can we purſue the method of it without becoming better.

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I may be ſtopt here by ſome who will reſuſe to eſpouſe my ſyſtem of the light, on account of the difficulty Mr. Mariotte had, in juſtifying this perſeverance of one ray in its own nature. He, on the contrary, pretended to have obſerved, that the different mediums through which he had conveyed it, had modified and changed it into ſeveral colours.

See Mr. Mariotte's works, Traité de la lumiere.

The neceſſity of certain precautions was not as yet conceived when theſe experiments were new. It may very well happen, that a ray will appear red, becauſe red is predominant in that ray, and thrown upon ribbons of other colours, when conveyed through a priſm that is defective. In which caſe it would be no great wonder, if the ſeparation of them was made in a ſecond priſm; and very likely this is what happened to Mr. Mariotte.

Though this firſt answer ſeems to me ſufficiently ſatisfactory, let us however add to it a ſecond no leſs acceptable; viz. that the teſtimonies of great men are liable to revival, in matters wherein the exigencies of the party they eſpouſe are concerned. Therefore, to the trials which did not ſucceed in the hand of Mr. Mariotte, I ſhall oppoſe the publick experiments

riments which have been made for these many years, and with so much satisfaction and success, at the marquis de L'Omaria's. The abbé Nollet, who makes and explains them with great clearness, has removed all difficulties, and rendered the certainty of them palpable. 'Tis true, the experiments upon light, and a multitude of others, appear at his house without the apparatus of lines and calculations which always attend them in the north. But by translating them as it were from Algebra into French, he has rendered them intelligible to the ladies, and to those who are least acquainted with sciences. By this method of using at first no other proofs but those which convince the mind by the eye, he gives people a relish for a more profound study, and often for geometry itself, whose demonstrations would at first have frightened them. But though he uses the utmost exactness in all his operations, every one owns, that those belonging to light, which are commonly so defective with others, never fail of success in his hands. He has convinced the most incredulous, that not only the body of light was spread all round us, but also that each ray of light had its peculiar nature, which it borrowed not from any thing else, and which was constantly the same, since it could not be changed by conveying it singly through twenty different mediums, and you might find it again at your pleasure, after you had reunited it in a mass with the other colours.

We can never express too great a gratitude towards these laborious gentlemen, who have either discovered or cleared up truths so very important. But let us not over-rate the value of their services. They went not beyond the ordinary sphere of our understanding, in informing us that colours make a part of light, and like it are indestructible. God,
in

in this point as in all the rest, permits us to view the out-side of his works, and more and more to be sensible of the wonders of them. He rewards and animates the labour of observers by new discoveries. But he deviates not from the general plan, according to which he refuses to our present condition the sight or intimate knowledge of the bottom of his works ; and since the great Newton as well as before, the nature of the light is an inconceivable marvel, a real abyfs, in which our mind can take no other part than that of admiring and adoring.

The PRINCIPLES of the known COMPOSITIONS.

If we make our attempts upon the air, it will indeed be every whit as incomprehensible to us : but among the different qualities we are allowed to perceive in it, we shall find that of indestructibility. I remember well that the most famous among our ancient masters of philosophy hesitated not in volatilizing air into fire, and readily condensed it into water, sap, salt, and all the other things in which they saw it enter and disappear. If you believe Mr. Rohault, the aerial particles draw near each other, and condensed become a vapour : this becomes rain : the rain changes into earth, which being softened and cast into narrow moulds hollowed into points, becomes salt : that salt being bruised, blunted, and rounded, is converted into oil or sugar. But this mechanism is altogether imaginary. You may beat salt, and blunt the points of vinegar for whole days, or if you will for months together : yet will they be vinegar and salt for ever. Natures may be mixed, weaken and assist each other reciprocally, and thereby produce effects very different. But the primitive ground of each is unalterable : nor shall I scruple to affirm in particular, that a globule of air was never and will never be any thing but air. This parcel of air may, in company

The indestructibility of the air.

company of water, insinuate itself, either through the leaves or the roots, into a plant. It will circulate through it with the sap; but it will be neither sap nor water, except in the sense in which our body is said to be dust, because earth is the main basis of it. This air possibly will get into an apple or a grain of corn, and help the nutrition of the animals who use that corn or that apple. It perhaps will creep through the small pores of an egg-shell or of a chrysalis, and contribute to the life of the chicken or the butterfly. But the air in all these situations is not destroyed for its being hidden or united to other elements. Every one knows that the water put under the recipient of an air-pump bubbles up, and renders part of the air it contained sensible. The air, 'tis true, is not in itself visible, even when it covers with a froth a liquor out of which it issues: but it is visible by the pellicle of water which envelopes the bubble. A wrinkled apple put in the same machine is no sooner unloaded of the pressure of the external air, but that which it contained immediately unbends all its springs, and renders the skin of the apple perfectly smooth. The same air which was not thought fine enough, to go backwards and forwards through the shell of an egg, or the tunicle of a chrysalis, comes out and shews itself in small bubbles through the water into which they were put under the recipient: and that you may not doubt but that this is the same air which we breathe; take the chrysalis of a caterpillar, and suspend it to a thread tied over a bowl of water, so that the tail of the chrysalis may keep in the water. This chrysalis drawn out of it a few hours after will produce her butterfly as ordinary, because it breathed through the apertures at-top. But if you plunge into the water the head or higher part of the chrysalis, where the imper-

ceptible

*Mr. De
Reaumur's
memoirs
upon in-
sects, Vol. I.*

ceptible vents that yield a passage to the air are, the water getting into them will soon kill the butterfly ; and the chrysalis, for want of breath, shall have nothing left to give you.

The PRINCIPLES of the known COMPOSITIONS.

A new-laid egg loses its quality from one day to another, and afterwards grows more and more empty, because the air passing freely through the pores of the shell, carries the nutritive juices out of it, and alters the fluids. Have you a mind to eat it perfectly fresh and equally full a fortnight or even a month after it is laid? Stop all the avenues of the external air, and all the issues of the fluids of the egg. This is commonly done in boiling water. The white in the boiling condenses against the insides of the shell, and stops the passage of the air. A month after if you put it again into boiling water, as is commonly done, but not quite so long, you find it again full, turned into milk, and as eatable as the freshest egg. This trial, which I have myself made, and which may be usefully practised towards the end of autumn, especially for the assistance of the poor in hospitals, together with the foregoing experiments, shews us the power of one element upon another, the inaction of water when it has no communication with the air, and the dissipation of water when the air gets into it, and carries it off in a free circulation. But in all these trials one element never becomes the other. The air which has crept into the liquors, for instance into common water, seems converted into water. It no longer gives any sign of its presence ; and one might be apt to think it either transmuted or annihilated, since it loses therein even all its compressibility. A pewter-ball full of water cannot diminish its bulk, shrink into itself, and flatten under the blows of a hammer, without forcing the water

to transfuse on every side. The air, did it continue in its own nature under the water, as it may be prodigiously dilated, might, it should seem, be compressed in proportion. The water might then prevail upon it to contract and make room for it: which does not happen. Shall we then believe it to be metamorphosed or destroyed? No: it is still the same: it is only confined, because it then loses the exertion of its spring under masses of water heavier than itself, and whose surface is moreover charged with the whole weight of the external air. But though a mass of water be specifically 850 times as heavy as an equal mass of air; this small globule of air overcharged, shall exert its spring, lift up the masses of the water, and manifest its presence so soon as this water shall in the air-pump be freed from the pressure of the external air. The air therefore is not destroyed by being mixed with liquors, and it remains therein just what it was before.

Here follows an experiment of another character, but which equally proves that the air mixt with water is not transmuted into water, since water, when divested of air, acts quite different from what it did in conjunction with it. If you shake common water in a long tube of crystal, the beaten air makes it froth; and flattening between it and the bottom of the tube as the water falls thereon, this air blunts the blow, and hinders the hard falling of the water, which makes but little noise. But if with the pump you exhaust as much air as possibly you can, not only from the tube, but also out of the water itself, and immediately stop the end of the tube at the lamp of an enameler, so that the air cannot re-enter it; then shake the tube: the water in its fall meets with almost no air interposed between it and the bottom

tom of the tube. It then touches the bottom with the whole extent of its massy surfaces, and makes it give a clear sound like that of silver, and as great as what the fall of a golden or marble-ball might occasion. The water may then beat, divide, absorb, and contain the air, or be dilated along with it; but it never changes it into its own substance, and air may be taken again from water whenever we please.

The PRINCIPLES of the known COMPOSITIONS.

Let us make air go through a harder trial still. Let us keep it for several years together in a close prison, and see whether captivity and torture will have any influence upon it. An air-gun has been invented, in which the air may be contracted and pressed down with a piston; insomuch that by dividing that small quantity of imprisoned air into ten or eleven portions, which you may let loose one after another by as many successive pulls of the trigger, you may (tho' this air be kept confined ten or fifteen years, or more) yet send out ten or eleven balls almost equally mortal. The experiment has been made at London and at Paris. What has happened? Has not the spring of this air, as well as any other spring kept bent too long together, been weakened? The spring of other bodies seems to be only precarious in them, and may be altered by many accidents. But the spring of the air, which possibly may be the principle of other springs, always continues in its strength; and the wind-gun, fifteen years after it has been charged, throws a bullet through a board at forty paces distance, as it would have done the first day.

The wind-gun.

The dilated air, I confess, has no longer the same strength, nor produces the same effects; but it is because this force exerts itself in a wider space, and upon a greater number of points. It is in reality the same, but more divided. Put this air

under the same torture again, and its full activity shall be restored.

It is then evident that light, fire, and air, tho' always together, yet are never confounded. They are substances which reciprocally displace each other, and by their mutual shocks communicate to each other celerities more or less considerable, and new determinations: but the one can never become the other. They have a nature and properties altogether incommunicable. We judge so; because we find them constantly the same after their most intimate mixtures. But the wonders of their structure are not so easily perceived as their effect and their existence. The human mind in good truth can understand nothing in them. It is therefore a very strange rashness to decide, that such or such a thing is sufficient to produce light, to ingender air or fire. Sure the ridicule of this is much greater than that of sending from Paris to Pekin a computation of the materials that shall be necessary for the repairing the palace of the emperor of China.

The inde-
structibili-
ty of wa-
ter.

The water, which has been so often represented to us as the product of an air condensed, or as the fruitful cause of a multitude of effects wherein it loses its nature to assume another quite new, through all ages and in all the bodies into which it enters, was never nor ever will be any thing but water. The changes of it are merely apparent; its nature is truly unalterable. Whenever fire ceases to communicate motion and fluidity to it, it is ice: it is in a manner petrified. But you know, that notwithstanding this strange alteration, it is really all it was before. When the return of fire loosens it, and puts it into a fluid state again, it then appears under its primitive form. Its parts cease to form a hardness under the universal pressure: they are separated by the insinu-

insinuation of an external agent, which raises and keeps them in a state of fusion: *The PRINCIPLES of the known COMPOSITIONS.*

When the fire influences this water more violently, it then treats it as it does lead and mercury. It dissipates it. What's become of it now? Why, it is in more places just what it was in a single one. As the lead (whether in a mass, melted, or evaporated) is always lead, and is found again without the least annihilation; the water likewise, let it become ice, wave, vapour, hoar-frost, hail, snow, rain, or dew, is always water. Evaporation makes it insensible to you. You would think it was no longer any thing but air. The air and the fire support it, 'tis true; but they never transmute it into their own substance. Would you have a proof of its existing still without any loss whatever? Oppose to the passage of this vapour a cold marble, a looking-glass, a bottle just fetched out of a place more destitute of fire than the external air. The fire therein finds pores proportioned to its tenuity, and enters into them. The water which we are looking for, and which we do not perceive in the air wherein it swims, being composed of masses too large, is stopt at the orifice of these pores, and you see it gradually condense on the out-side. It was attenuated, volatilized, and taken from your sight; but not changed into another nature.

When this vapour is carried higher, it thence comes down again into rain. This rain introduced into plants and fruits, disappears anew. But it there becomes the vehicle of the salts, oils, and other principles, whose various mixtures and different temperaments constitute the tartness, ripeness, insipidity, and rottenness of the fruit. In order to make yourself sure that this water is not lost there, you need only have recourse to analysis and the alembic which return it faithfully to you.

The nature of water is then independent on whatever surrounds, attenuates, raises, disguises, and mixes with it. But no agent is more capable of ingendering than capable of destroying it. Nor is there any intelligence that can sincerely flatter itself of knowing it. Would it not then be perfectly senseless to pretend to give one a receipt for the making of water?

Let us pass on to the examination of oil. This again is the result of a precaution, which could not any where reside but in the counsels of the eternal wisdom, not in any natural agent. I own, that oil seems not to be an element so simple and uncompounded as light or water. Every oily juice always contains a great deal of fire: and in the decomposition there is no oil but what yields much water, many globules of air, together with a few salts, a little earth, and something of the essential parts of the animal or fruit out of which it is extracted. I own besides, that after the division of these principles, the same body of oil cannot be revived or re-established, as after the analysis of cinoper into sulphur and mercury you again may form a new mass of cinoper by the re-union of the mercury and sulphur. But it is the very composition of oil that makes me look upon it as a kind of organized body, purposely made to be replete and swelled by the bodies which insinuate themselves into it, but which no natural agent was ever able to construct, nor any intelligence able to conceive. Pray, who has ever been able to re-unite in the globules of oil a proper dose of principles so very different? Who has been able to bridle them notwithstanding their agility and natural violence? Who ever was able to restrain them in peace, notwithstanding the perpetual shocks they mutually give each other? None but he who fore-
saw

saw the vast utility which man might borrow from oil, has been able to prepare cells capable of every where conveying, and of keeping in store for all the wants of man, the exact quantity of fire and air that will supply his hearth; the precise quantity of water which is to inwrap the fire and form the flame that shall warm and give light to man; the just portion of saline, terrestrial, vegetative, or metallick particles, which are to inform him by a diversity of flavours and odours, of whatever concerns him. I pass over in silence the other utilities of oil, which are numberless, to confine myself to this wise temperament of different principles, and to the structure itself, which must needs be admirable in this liquor. One would be apt to look upon the globules of oil, as so many minute sponges regularly constructed, and divided into thousands and thousands of cells, with as many valves, that they may be able successively to fill and empty, according to the agent who presses them. When the external fire has expelled out of them the principles that were detained therein; these sponges remain only like so many flattened purses, but which being volatilized by this evacuation, and tossed about in the air, there swell with a new fire, and are again saturated with other vegetative, terrestrial, or metalline principles, being conveyed sometimes into the plants, sometimes into the bowels of animals, or under ground, and along the metalline veins which there are spread. The principles which we just saw re-united in the oil, possibly are retained therein by salts of different kinds. It can hardly be doubted, but that the fire and water which are in sulphur, are imprisoned there by the points of the vitriolick salt, which the sulphur put into the fire darts out on every side, and which spread so disagreeable a smell. At

The PRINCIPLES of the known COMPOSITIONS.

The HISTORY

this rate, there should be a primordial bitumen, an elementary oil, which would consist only of a multitude of minute volatile sponges, which being exalted into the air, or carried thither by the water, might be saturated and filled with particles of fire, air, salt, and other elements, then be unloaded of them by the violence of fire, and repeat the same services by a perpetual circulation.

This mechanism is only a suspicion, but it ripens into a reasonable presumption, when we judge of the conduct of the Creator in this point, from what he observes in his other works. Let us take for our examples salt and the other elements remaining to be examined. They only change their form, that is, their accessory matter. The grounds of them remain indestructible.

The inde-
structibili-
ty of salt

The salts (if we are however to admit of any other than the acid salt which appears the most sensible to us) are all of an immutable nature, and likely as improductible as immortal. This saline nature, which all judicious chymists acknowledge to be altogether above their understanding as to the ground of it, is sensibly diversified according to the nature and quality of the oils, earths, metals, and other substances to which it is united. But after a thousand successive mixtures and separations, it is found again in nature and in the laboratories of the chymists. The water, after having dissolved the salts thrown into it, seems to have absorbed and annihilated them. But it is no sooner evaporated, but, a few volatiles excepted which rarefied water may keep up and carry away with it, you find again the same salts in their nature, precipitated one upon another like so many small crystals at the bottom of the vessel. There are a thousand ways of disengaging salts out of what surrounded them, and out of what rendered them some-

sometimes fluid, acid and tart ; sometimes alkali-
line, hot and bitter ; sometimes saccharine and of
the nature of syrup. After the operation they are
found again more or less purified and transparent,
according as they recede from or approach again
to their primitive simplicity. Dissolve, filtrate,
and evaporate them twenty times over, your labour
will end in a crystallization, which will always re-
turn you the same salt. Nature and the hand of
man therefore may vary, colour, and change the
qualities of salt, unite it with new matters, and
separate it again, ; but they can neither produce
nor cause it to perish. Men only know how to
make use of it.

The PRIN-
CIPLES of
the known
COMPOSI-
TIONS.

Sand is another element full as simple as the fore-
going ; and such as it came out of God's hands,
such will it remain through all ages. Nor will any
cause or agent whatever be able to retrench from
or add one single grain to it.

The sand.

Sand is naturally inflexible, massy, and transpa-
rent like crystal. We are even informed by the
microscope, that it is true crystal ; which gives us
room to think that crystal is no more than a mass
of pure sand. I expect that those who want no-
thing but matter and motion to construct the
world and all its parts, will be able exactly to tell
us what crystal is, and in what it intimately differs
from light or from common earth. However, as
I thought experience was to be consulted before I
should hear them, I am thereby informed, that a
grain of sand or of crystal, as well as any other ele-
mentary part, is a simple nature, or one whose com-
position is known to God alone, since we can nei-
ther resolve, nor of course assign the principles of
it. But the same experience informs us, that, as
the effects of light, fire, and air, shew us the flui-
dity, the activity and elasticity of these elements ;
we

we are, from constant appearances, likewise authorized to attribute to sand particles at rest, strictly united, and, notwithstanding their hardness, transparent. I find again here, as well as every where else, the uniform conduct of the Creator in the lights he grants us. He hides from us the structure of crystal, and only shews us the service and properties of it. Let us follow these.

The minutest grains of this element, not our common sands which are small rocks already formed, and perhaps mixed with some other matters, but the sands by their minuteness imperceptible to us, may be carried away and wrought by the air, the water, or the fire.

I indeed believe, that a small mass of air being specifically less bulky than a like mass of sand, will not carry it away. But this very fine sand may be united to laminæ of wood, dust, wool, flesh, and other things; with globules of air rarefied in their interstices, so that these particles or corpuscles shall be capable of being in equilibrio with the globules of the denser air, whose room they take up. These corpuscles of course shall be able to float in it; it is what we really see happen, when a ray of the sun strikes across the air of a dark room, and is reflected from the surfaces of this minute dust. Thus the air becomes a magazine full of water, salt, earth, oil, and sands, which every living or vegetating creature may reap the benefit of.

The fine sand likewise may be carried by the waters that run under ground, and may happen to be united sometimes with salts, sometimes with oils, or with other earthly or metallick matters. They shall be able thus to assume several colours and different qualities. Crystals and perfect diamonds may be formed thereby; which however shall be
more

more rare, as these require a sand altogether pure. Rubies, saphirs, and all other coloured stones may be formed the same way. More easily still will their union with other abundant matters produce strata or large beds of marble, slates, flints, chalk, and of stones of all kinds, which will differ both in colour and quality.

The PRINCIPLES of the known COMPOSITIONS.

The action of the fire upon sand shews itself in the vitrification. This in reality is nothing but a mass of sand and salts, whose stiff transparent particles being freed from the other matters, by the insinuation of the fire, sink and contract by the departure of that element. And as the activity of the fire kept before in a state of separation these cubical, triangular, round, &c. sands, when these masses draw near each other again, you find not (as in the crystallizations made successively and by strata) sands of a finer kind, which a small quantity of water introduces into the interstices of those that are large. This mass, which the fire quits intirely, must then be extremely porous, and but little coherent. Thence the brittleness of glass notwithstanding the natural inflexibility of its elementary particles.

This vitrification is the last analysis or the last term, which all the sand contained in the mineral matters or others can be brought to by the force of fire. The action of this element is sometimes so violent at the focus of large lenticular glasses, or at that of concave burning-glasses, that all the air around it is agitated thereby. There happens what we see in all fluids. The motion of a mill at the opening of a flood-gate, successively draws all the water of the reservoir to that part. The terrible fire made at the focus, agitates the whole fluid next to it, draws in an instant and from all parts that minute dust which flies in the air, and finds therein

therein either oils capable of augmenting the weight of the matter put in fusion, or sands capable perhaps of absorbing it by a sudden vitrification (*a*).

If you again put the vitrified matters into the fire, you will separate from them the metallick, which appeared transmuted, but which was only absorbed therein. The sand on its part will shew itself anew by a second vitrification. The pieces of that glass, and generally all the shards of broken bottles, being thrown into the glass-pot again, will yield you glass for ever. Pound this glass: try to blunt the corners of it, to attenuate, and if you will to make it an impalpable dust: when again put into the fire, it still proves glass, and will never be any thing else. Why does this sand a thousand times re-appear under the same form after the most violent operations? It is because no agent nor any kind of motion is capable of altering what has been once restored to the simplicity of its nature. This is a special work of the Creator. It is a matter he has determinately made such: Who shall be able to change it? But it is much easier to alter and decompose what exists, than to produce what exists not. If then there never was any agent capable of changing either the sand or the glass; of course there is none capable of producing a single grain of them. This makes me before-hand apprehensive for the hard atoms of Democritus, and the cubical ones of Descartes. These corpuscles are visibly sands. But sand never alters. Rake up the chaos of sand; our philosophers will fetch the world out of it: but experience fetches only sand therefrom.

(*a*) Explication of the pretended vitrification of the gold made by Mr. Homberg.

We are authorized to say the very same thing of the common earth. The nature of it is no less incomprehensible, and as certainly invariable. Whatever part of earth enters into compositions, is manifested in the analysis, or by the force of fire in a calcination. The common earth alone shall not be vitrified there; but it will be reduced to lime, that is, into ashes. It may be disguised or absorbed sometimes in a metallick fusion, sometimes in a vitrified sand which gets the better: but it is found again. The fire may divide, subtilize, and partly disperse it in the air: but that part of it which escapes, and that which remains in our vessels, is and will never be any thing but ashes or dead earth. That portion of it which shall be dissipated on account of its fineness, shall run with the water evaporated in the air, fall again with the rain, and with the sap creep into the plants. Burn these plants, and divide the principles of them, you will find again your ashes and your dead earth in the final operation. But you can never go any further; and this term puts an end to our researches, because we are arrived at the elementary nature.

The PRINCIPLES of the known COMPOSITIONS.

The indestructibility of common earth.

As there is no further analysis to be made when we are come to a vitrified sand, or to the calcined earth, we can no longer know any thing in them. We see that these matters are equally indestructible, and appointed to be the infallible supply of a multitude of compositions and uses, which have been distinctly foreseen. We are allowed to perceive this design, and to praise its author for the same. But it is in vain that our philosophy attempts to penetrate further. We are no longer able to determine, what it is that intimately distinguishes elementary sand from a grain of earth. How then can philosophy with any decency attempt to assign what

what the constituent particles of sand, or the productive causes of earth are?

We may with confidence range in one class with these simple substances whose mixture and combinations afford so many helps to man, all primitive metals, such as gold, silver, copper, tin, steel, and lead. Nor do I see any reason for not joining to them that metallick fluid which we call mercury or quick-silver. I know not in the least what gold, silver, or any other metal in itself is, or what texture distinguishes one from the other; and herein I resemble all men that have been or ever shall be. But upon the infallibility of an experiment incessantly repeated for these many ages, I will venture to affirm that these metals are improducible, incommutable, and indestructible. Do we make them pass through the trial of fire and of dissolving waters? These metals, after never so many separations, prove invariably the same. The quick-silver in appearance lost in the compositions it is to enter into, appears again when summoned to shew itself. All that is evaporated of quick-silver or of melted lead, is neither destroyed nor changed; since we collect it whenever we please in the recipient, and restore the whole into a mass again. The metal dissolved in the aqua-fortis or the aqua-regis, escapes our eyes only. When this water, of two metals offered to it, can support only one in a state of dissolution; the other sinks, and is found again in small parcels. This gravelly matter looks like lime or ashes: but it is real metal, and a few unctuous matters are sufficient to help the cohesion of the metallick particles, and to put them into a mass again. The phlogistick juices, that is, the fats which revive or rather give a coherency to the metals, and render them soft, ductile, and malleable; the earths and sands which
render

render them rigid, hard, and imperfectly coherent, pass in the minds of alchymists for the principles productive of the metal itself. But who is the man unprejudiced by false opinions, that does not see that these principles, far from forming the metal, are foreign to it, and at most are able by their insinuation to make the bond of it, to assist its gathering together in a mass, and to alter or vary its qualities? The matters which are joined to the metals, will successively shew us a dissolution, a calx, a mass, a fusion, a calcination, a vitrification, according as the vitriol, the quality of sharp waters, unctuous matters, the fire, the earth, or the sand, shall be predominant in the operation. But if you give fire twenty times over to a petrification already well purified; you must not expect the least grain of metal from it: just as gold once purified will be gold for ever.

The PRINCIPLES of the known COMPOSITIONS.

A Dutch professor *, famous by his application in improving physical experiments, has made a very great number in order to come at the knowledge of what constitutes the virtue of the load-stone. These he communicated to the public, and has done himself much honour, by the candor with which he confesses, that all his labour could not procure him any knowledge as to the ground of this virtue, nor concerning the nature of the stone itself. But among the experiments he mentions, there are many which demonstrate to us, that metals, sands, and earths, are invariable in their nature. He has made several operations upon a black dust (a) very magnetical (b), which is brought from Virginia. He has, after many trials in the sharpest fire, found that it may be calcined,

* Mr. Mure.
 schem-
 broek.

(a) It is also mentioned in the philosophical transactions.

(b) They call that magnetical, which has the properties of the load-stone.

but

COSMO-
GONY.

but never vitrified. He has several times pounded the load-stone, and having mixed it with the acid-marine-salt, and with the spirit of nitre, and for many days together made it pass through several volatilizations, digestions, and separations, having enveloped or incumbered it so as to render its magnetick virtue insensible and of no effect, he at length again found a black dust, which attracted the needle of the sea-compass, and stuck to the knife touched with the load-stone. He frankly confesses that the load-stone made to go through all the trials of dissolving waters and of fire, loses neither its nature nor its virtue (a).

There result
of these
experi-
ments.

It is then a truth resulting from the series of all these operations, that man's whole power amounts to uniting and disuniting what is already made; but that it produces nothing. That his understanding may go so far as to reckon up the principles of what he can analyse or resolve into different natures: but that it would be a rashness in him to attempt the assigning principles of composition in a nature so very simple, that he can neither change, nor destroy, nor know any thing whatever in it.

Now, if an experience superior to all arguments demonstrates to us, that motion brings about nothing new, and that the nature of every element is altogether inaccessible to our sight; much less are we intitled to pronounce that the world might come out of an agitated chaos, or that such or such an element may proceed from such or such a cause; the effect and cause being equally unknown to us. That philosophy is then demolished which has recourse to general laws or a general impression of motion, to produce the universe: while expe-

(a) *Magnetem quomodocumque tractatum manere magnetem.*

rience,

rience, if it be but consulted, obliges us to acknowledge the special operation of the Creator, in the structure of a single grain of gold or of load-stone, as well as in the forming of the organs of the whole machine. But though experience gives us no advantageous opinion of philosophy; yet does it not authorize us to despise philosophers. It is right to hear them: and we shall perhaps be readier to take instructions from a better master than philosophers, if we listen to each of them separately.

PRIMITIVE
MATTER.

IV.

The primitive matter of the Greek philosophers.

THE whole bulk of the immense volumes which the ancient and modern philosophers have written upon the manner in which they conceive, or imagine they conceive, the primitive structure of the heaven and earth, may very conveniently be reduced to these four famous verses of *La Fontaine*:

* Un bloc de marbre étoit si beau,
Qu'un statuaire en fit l'emplette.
Qu'en fera, dit-il, mon ciseau?
Sera-t'il dieu, table, ou cuvette?

* A rough
piece of
marble was
so very fine,
that a sta-
tuary
bought it.
What shall
my chisel
make of it,
said he, a
god, a
table, or a
cistern?

If you break the marble-god, what will remain? Why, pieces of marble. Break the table, or the cistern, it is still marble. The same ground every where presents. These things differ only in their outward form. If instead of marble you take clay, that which was a plate, coming out of the potter's hands, may, if he pleases, become a candlestick immediately. All that philosophers have said up-

on the matter fufceptible of all kinds of forms, amounts to no more than this. But this idea of a common matter of which all things are indifferently made, is a real ftumbling-block, upon which almoft all philofophers one after another have ftuck. In examining the operation whereby the world was formed, they all would needs find the model of it in the action of the man who produces a work. But this is the fource of a falfe philofophy which has led many a man to irreligion. When a man is making any work, he uſes a matter he finds already made. The whole induftry of the artiſt conſiſts in diſpoſing rightly pieces which have already a certain determined nature, and which have not in the leaſt borrowed it from him. If two men make each a pendulum-clock, one with poplar-wood, the other with braſs; there is the ſame ſkill in the ſtructure. Theſe pieces differ only in the choice of the matter, which is brittle and of no great ſervice in the one, but moſt excellent in the other. It is then the goodneſs of the matter eſpecially, which adds the chief value to the work. Let the order of the world, therefore, be ever ſo magnificent; the chief merit of this noble work conſiſts in the excellence of the ſeveral elements which conſtitute the baſis and inſure the ſervices of it. Has the power which formed the world found theſe matters and elements pre-exiſting and already made? If ſo, the artiſicer who imploied them has not the glory of what is moſt excellent in the work. Has he, on the contrary, created them all purpoſely, and each of them by a ſpecial act of his will, and from a knowledge of the ſervices he expected from them in giving each of them an invariable nature? In this caſe, the univerſe is full of the magnificence and wiſdom of its author. The minuteſt grain of either gold or ſand proclaims his glory,

glory, as well as the heaven with all the flambeaux that embellish it. PRIMITIVE
MATTER.

But have these elements, so constant in their duration, and so various in their excellence, been constructed apart, and each by an express command, without any resemblance to each other? Or are they, like the several vessels of a potter, made of a mould common to all? The philosophers both ancient and modern, scholasticks and corpusculists, though ever so opposite among themselves as to the manner in which they construct their world, yet all agree in one point, supposing a common matter indifferent to become whatever they please, and out of which they fancy themselves authorized to fetch gold or mud with equal facility (a).

A single man among the Greeks has deviated from the common way of thinking, with regard to the first grounds out of which the universe was fetched. This is Anaxagoras in his Homœomeria. We may with Lucretius say, that our language has no proper term to render the sense of this. But what cannot be described by a simple word, may be understood by a more particular explication.

The Homœomeria (b) amounts to the saying, The world
of Anaxa-
goras. that each totality in nature is composed of parts which

(a) This is the first proposition of Mr. Boyle in the book by which he undertakes to refute ancient philosophy. I agree, says he, with the generality of philosophers so far as to allow, that there is one catholick or universal matter common to all bodies. Origine of forms and qualities.

(a) *Nunc & Anaxagoræ sectemur Homœomeriam,
Quam Græci memorant, nec nostrâ dicere linguâ
Concedit nobis patrii sermonis egestas:
Sed tamen ipsam rem facile est exponere verbis.
Principium rerum, quam dicit Homœomeriam,*

which before their union were already of the same nature as the whole. A bone is a composition of small bones. The bowels of animals are a composition of small bowels. The blood is nothing but a collection of minute drops of blood. A mass of gold is a collection of particles of gold; the earth a heap of small earths; the fire a gathering of minute fiery particles; the water a lump of aqueous corpuscles: and the same in his opinion with all the bodies we see.

What may have induced Anaxagoras to espouse this opinion, is, that he observed that a drop of water, though ever so much divided and evaporated, yet was always water; and that a grain of gold divided into ten thousand small portions, was in the ten thousand particles what it was in the whole. Anaxagoras had a glimpse of truth as to this point; and had he limited his principles to the simple natures which experience shews us to be indestructible; he would have been in the right not to admit in these natures any except new combinations or transitory separations, not any new generations. But he deviates from truth in points of the utmost importance.

His first mistake consisted in extending his principle to mixt bodies. It is not with blood as with water. The latter is simple, whereas blood is a mixture of different particles of air, water, oil, and earth, which were contained in the food. A

*Ossa videlicet ex paucillis atque minutis
Ossibus: sic & de paucillis atque minutis
Visceribus viscus gigni, sanguenque creari
Sanguinis inter se multis coeuntibus guttis;
Ex aurique putat micis consistere posse
Aurum, & de terris terram concrefcere parvis,
Ignibus ex ignem; humorem ex humoribus esse.
Cetera consimili fingit ratione putatque.*

Lucret. de Nat. Rerum, lib. 1. ver. 830.

second

second mistake is the extending the same principle to organized bodies, as if a multitude of small bowels might any way assist the organization of the bowels of an ox or a camel, and of the one rather than of the other. But I shall call impiety rather than a mistake, the opinion that God, in order to create the world, has only put together and united matters already made; so that they are indebted to him neither for their being, nor their excellence; and that what is most excellent in the universe, I mean this variety of natures actually unalterable, preceded the making of the world, instead of being the result of it. But the impiety of this philosophy finds its refutation in the very ridicule which attends it.

You ask Anaxagoras what the origine of a slip of grass is. He in the philosophick strain replies, that you must go back to the Homœomeria, according to which God has only drawn near together minute slips of elementary herbs, which had like him existed from all eternity. “*All things,*” says he, *were confusedly together,* (this is what may be called Pan spermia, or a mixture of all the seeds) *and the spirit coming afterwards, has of them composed the world (a).*” If any one should ask me of what wool and by what hand the cloth I wear is made, would it be a just answer to say, The cloth existed, and a taylor has taken some pieces of it, which he sewed together to make me a suit of cloaths? But here is something still more ridiculous. Our philosopher argues upon the origine of mixed and organized bodies, like one who seeing some analogy between the figure of a cat and that of a tyger, would say that a tyger is a composition of many small cats united

(a) Πάντα χεήματα ἦν ὁμῶς· εἶτα νῦν ἐλθὼν αὐτὰ διακόσμησε.
Diog. Laert. l. 2, n. 6.

on purpose to form a very large one ; or like one who, in order to let us into the origine of watches, would tell us, that an artificer having found a multitude of watches so very small that they could not be seen, had collected them in a box, and of them had made a large perceptible one.

The Homœomeria being, like many other systems, even the most modern, nothing but a method of discoursing in the learned strain of what we do not understand, let us here leave the world of Anaxagoras, and examine that of his master.

Water the
principle
of all
things.

Thales, the founder of the Ionian school, had learned from the Phenicians what these knew by tradition, or had received from the Hebrews their neighbours ; that there was a state of imperfection which had preceded the intire accomplishment of the heaven and the earth. But they had disfigured this idea, and had framed to themselves a chaos of universal matter, out of which each of them fetched the world in a very arbitrary manner. The notion of this confused matter, common to whatever exists, has run from school to school, and we are going to see all the philosophers handing it from one to another down to us, always in a new dress, though with no great variation as to the ground-work.

Thales, who was an observer, would not be satisfied with a ground of physicks impossible to be demonstrated. He thought he had perceived that water constituted the universal basis or the common matter of which all things are made. This philosophy was long in vogue in Ionia, and in Greece. It was the system of those times. Every body would needs speak of water. With water they accounted for every thing. And when Pindarus in the beginning of one of his odes says, *that water is good* ; this word which now seems cold and

and misplaced to us, had at that time a scientifick PRIMITIVE
air, and intimated that the poet was a philoso- MATTER.
pher.

Thales had some appearances in his favour. Does not whatever corrupts and is dissipated, vanish into vapours? Do not vapours contract into dew and rain? Does not rain produce new generations? This transmutation of water into other natures, and of these natures into water, has been since maintained by Vanhelmont of Bruxelles. He promised to make with this generative and transmutable water a balsam that would make him live many ages, and to give his disciples as much gold as they might want to put them in easy circumstances. But he was hardly fifty when he parted from his family, and left this world unworthy to possess so valuable a man. Let us not insist upon the reasons he had to die so unmercifully, and so soon to leave his family, which was rich neither in his days nor after his death. Let us soberly be contented with the examination of the method he used to justify his promises. To make gold, said he, water alone is sufficient; since a tree, an animal, and the whole world, may be made with water. He thought it not proper to enter into his laboratory, and to produce a tree, in order to make his words good. But he put forward an experiment in which he worked upon a tree already made. It was a small willow (a) of five pounds weight, which he had planted in a lixivial earth of 200 pounds weight. That willow in five years time came to weigh 164 pounds, besides the weight of the leaves which fell from one year to another. The earth it was in, being weighed five years after,

(a) *Complexionum atque mixtionum elementalium figmentum.*
Num. 26.

happened not to have lost any thing of its weight. Now this small tree had from the moisture alone of the waterings not only all its weight, but the oil, water, salt, air, and earth it was composed of, and which were found therein by analysis.

Let us to this experiment add, if you will, that of pease, beans, and other grains, which are made to open, blossom and fructify without the assistance of any earth, by wrapping them up in a small quantity of wool, and by letting them shoot forth their fibres through a little grate to fetch all their nourishment from the water in a bowl placed directly under them.

These experiments at first seem favourable to transmutators. But when closely examined, they become excellent proofs of the reverse of what they advance. This analysed water is invariable in its existence, and far from being sufficient to produce a plant; there are plants, even among those that grow in water, which perish therein though it be their own element, when the air is excessive hot, or over-moist: a proof that the air, and a certain kind of air too, must with water concur to nourish them. It is not even properly water which constitutes the ground of their substance. This element is only the vehicle of the salts, oils, earths, and other principles which it has attenuated, and which it conveys into them. It even carries into them iron, very likely because they stand in need of it. But the water has been converted neither into salt nor iron.

It is easy to perceive, that the alterations of nature not well examined, are what gave occasion to the other masters of the same school to construct the world with the element of fire alone, as did Parmenides, or to reduce all generations to the single principle of the air, as did Anaximenes. None
of

of these worlds has any manner of resemblance to the true one: experience demolishes them all. PRIMITIVE
MATTER.

Let us listen to Aristotle. Of all the Athenian schools his is that which meddled most with physicks. Besides, hearing Aristotle is knowing what has been taught in the schools of the last seven or eight centuries. Hardly any other physicks than his have been known till the eighteenth century. According to him, what is fire may become air, what is air may become wood, and what is wood may become ashes or gold: because all these things are matter, and only differ by the form which may be altered. The pri-
mitive
matter of
the Peri-
patetics.

If you ask him what matter is, he will tell you, *Physic. 2. 1.* *that it is what is neither which, nor how great, nor what, nor anything of what being is determined by.* I don't understand Aristotle, you will say. He explains himself in another place. *Matter is the first subject of every thing, which always subsisting therein, makes it a being by itself, not by accident.* But this perhaps will not be more intelligible. Let us then use some other method.

If you should examine why God gave flowers, seeds and germina to plants; you would that moment think neither of a pear-tree, nor of a rose, nor of a nut-meg. You would only think of plants, flowers, and seeds in general, without giving attention to any particular species. But if God was willing to create a flower, he would not make a flower in general; for a flower in general is nothing, at most it is a thought. God in this case would make either an anemone or a tuberosse, a belladone or some other flower. When a man has a mind to become a geometer, and learn the just means for measuring all sorts of bodies according to their length, breadth, and depth; he considers matter in a general way: He thinks of a body
extended

extended in length, breadth, and depth, without giving attention to a mountain, a star, a garden, or any thing determinate ; without taking notice whether that body be at rest or in motion, whether it has such name, figure or quantity (*a*): He thinks of body in a loose and vague manner, without specifying any thing. But if God creates a body, he will not create a general body. A body in general, a nature generally taken, which has no form either in its totality or in any of its parts, exists only in our thoughts. Though God were to make a mass uniform in all its parts, and as large as the world itself ; it would be a body of a determined nature, since all the parts of it would be alike. It would for instance be a large mass of sand, or of gold, or of any other such element. If God should on the contrary make a mass composed of parts of different natures ; it would be a totality determinately composed of such and such natures.

Aristotle and the schoolmen accustomed to range their own thoughts in a certain order, and to begin by considering things in a general manner, before they descend to any particularity, have realized this notion of vague and undeterminate matter, as a ground which subsists the same in all bodies. On this account it is, that those who came after him being used to treat every thing according to the same method, and to consider flowers in general before they descended to the species ; many of them have coldly, and even with wonderful obstinacy asserted, that the universal was in each individual object, and that the flower in general was a reality truly existing in each junquil or violet.

Solid genii a great while ago found out, that Aristotle's categories did not in the least capti-

(*a*) This Aristotle's definitions signify.

vate nature. If primitive matter had no other foundation but this method of ranging ideas or of conceiving things, it would be a being merely imaginary, and we should not lose much of our time in demonstrating, that such a matter, though indifferent as to becoming water, fire, iron, or gold in the brains of philosophers, will never produce any thing new, nor suffer any alteration in the crucible ; because a body in general is neither more supple nor more susceptible of forms than non-entity. But it is likely that by primitive matter Aristotle did not understand merely body in general. It was according to him a very real ground. It was in his notions, and notwithstanding the obscurity of his definition, an uniform dough of which every thing was to be made ; a yielding wax which he looked upon as the common ground-work of bodies, and also as the last term each body was in its destruction reduced to. It was *La Fontaine's* fine rough block of marble. At this rate, the mass of each body is at bottom the same. They differ only as to the quantity, rest, or motion, all which are accidental things. This notion appeared so very specious in the eyes of all philosophers, that they generally espoused it. Nothing is more comical than the confidence with which they all of them tell you ; Give me matter and motion, and I shall make you whatever you please. They have had both these at their disposal for a great while : nor have we for all that been a whit the better naturalists, nor the richer men.

'Tis true, some have said that this wax, this common clay, was a collection of crooked, square, round, triangular, &c. atoms : others, that it was a composition of cubes or small dies ; and others again, that it consisted of small vortices composed of soft or hard particles. But they all of them, both

PRIMITIVE
MATTER

Primitive
matter.

COSMO-
GONY.

* Keill. in-
trod. ad
veram
physicam,
lect. 8. p.
78.

both ancient and modern, sometimes in abusing Aristotle very much, and calling him names, do him the honour at least unanimously to own, that there is but one fundamental clay *: that this is the same in the heavens and upon earth ; and that what constitutes the ground of wood, is also essentially the ground of gold or of mud.

Now this notion of a general matter into which all bodies are resolved in a final decomposition, is contradicted by experience. Were it as they say, this must be the consequence of it. As motion makes an animal, a piece of wood, a mass of gold spring out of that wax ; motion in taking from them a transitory form, ought again to restore them to their primordial wax. This Empedocles, Plato, Aristotle and the schoolmen say. But it does not so happen. The organized body is dissolved in different masses of skin, hair, flesh, bones, and of other mixt bodies. The mixt body is resolved into water, sand, iron, and earth. But notwithstanding the strongest dissolvents and the most violent fire, you never will obtain any alteration in these simple bodies. The sand remains sand : iron remains iron. The purified gold undergoes no change. Dead earth will be for ever earth, and after all the trials and tortures imaginable, you will find them still the same. Experience goes no further. Those therefore who resolve the gold and the earth into other principles which are neither gold nor earth, advance what they know not. Whereas if they are but willing to speak according to the truth of notorious facts, they will tell you, that compound bodies dissolve into several elements ; and that these elements, such as gold, iron, all the other simple metals, earth, fire, water, sand, and a few others, are so many natures having nothing common one with another. That these elements

Elements are, each separately, wonderful works that cannot change; that the world which is made of them may receive alterations by their different mixtures, and yet be as durable as the principles which constitute the basis of it. PRIMITIVE
MATTER.

After having opposed the experience of facts to the principle of the primitive matter, it finally results that this vague matter is a chimæra, and that God neither found nor made it to compose the world therewith; since neither after the trials of many thousands of years, nor after the natural dissolutions, nor after the artificial decompositions, any philosopher that ever lived has been able to find at last the least inch, nay, the least grain of this primitive matter, and positively to say; Here it is.

What will then become of the three worlds which we are going to extract from it, *viz.* the world of Aristotle, that of Epicurus, and that of Descartes? It is before-hand evident, that they are all constructed with a matter, of which they have discoursed without knowing any thing of it, and which is really no where in nature found.

A matter in general, a matter that has no form, may assist the thoughts of the categorist. A body extended in length, breadth and depth, may help the thoughts of the geometer. A substance composed of parts placed one by the other, may enter into the definitions of the Cartesians. They all fancy they say things very different: but they all express a vague thought, an abstract idea; and utter nothing that has more reality in it than a flower in general which exists no-where. It is an easy matter to argue upon the uses of the roots, supports, petals, stamina, and pistillum of a flower in general. Nor is it more difficult to discourse upon the length, breadth, and depth of body in general. But neither is the general flower,
nor

nor the substance generally extended, a real being.

V.

The world of Aristotle, the elements of the Peripatetics.

ARISTOTLE, Empedocles, all the Peripatetics, and all the schoolmen after them, in putting at first in their categories, that is, in the stores of the ideas out of which they built their systems, an immense mass of primitive matter, had certainly stuff at discretion: they could cut as they pleased, and might have constructed with it a world a little better framed than that they have given us. They were contented with fetching out of it four elements, fire, air, water, and earth, which they thought were sufficient to form what we now see. However the beauty of the heavens made Aristotle to suspect, that they might be very well constructed of something finer still. Wherefore he made a fifth extract out of his primitive matter. He fetched out of it a quintessence wherewith to construct the heavens. Philosophers have ever been prepossessed with the thought, that any new word they invent is a new thing discovered by them; and that what they clearly dispose in their own thoughts, must of course be found such in nature. But neither the authority of Aristotle or of the other doctors, nor the clearness of their ideas, or the pretended evidence of their arguments, can warrant any thing real to us. Nature may be quite different. Nothing but experience can authorize us to say, Such a thing is, or such a thing is not. Now this experience being applied to

to the peripatetic world, that world is a building immediately sunk into nought.

*The world
of the PERI-
PATETICS.*

First, let us not examine too closely, what the thought of the prince of philosophers was, upon the mover who had fetched out of the primitive matter the four or five elements, of which all things, according to him, were made, and into which they are transmuted through all ages. We should find (if we believe many among the learned) that this great genius knew not so much of this matter as the youngest infant who begins to adore God; because the latter has been made to observe, that there never had been any work well ordered and purposely constructed, that was not made by an intelligent artificer. Let us allow Aristotle and his partizans their quintessence, which they for certain had no manner of knowledge of. Let us insist upon their four elements, which still constitute the grounds of the popular philosophy.

It is a more than ridiculous presumption to advance, that four elements are sufficient to construct the world. When we build a house, we say; So much sand, so much lime, so many stones, so much wood, iron, and slates will be necessary, nor will there be any need of more. If we argue rightly in this conjuncture, it is not that we in the least know what these matters in themselves are. The bottom of them is a secret to us. But experience has taught us what use we might make of them, and accordingly we range and dispose them with success. We form of them a building which is a shelter to us. Our science consists in rightly trying the different services which these matters may be of to us: and it is our business thus to work what is within our reach, and stands convenient for us. God imparts his science and power to man. He permits
man,

man, confined within the bounds of his own knowledge and wants, to become in a manner creator of a multitude of works, and in the exercise of his faculties to embellish and improve the abode he has appointed for him. But shall this man, rushing out of his sphere, pretend to become the architect and inspector of the Almighty's works, instead of remaining the spectator and enjoyer of them! Shall he familiarly come and sit by God himself, and presume to say, We shall want no more than five, four, or even three elements to construct the world, as if he had been asked his sentiments concerning the frame of this work! And who are ye, will the Lord say to them, that ye should presume to depreciate my works? I have given you an intelligence and senses to try every thing; hands to act, and a heart to praise me. Surrounded as you are with wants and blessings, be neither stupid, nor idle, nor ungrateful. Such is the glory to which I have called you. Preside over what I have placed in your hands and under your feet. I consent that my creatures should serve you. I have given them several degrees of excellence, which your senses will enable you to discern, and which will assist your labour. But know your own selves. Know the measure of your lights and power. Did I call you into my councils, or have I revealed my ways unto you? Build a hut, or a palace little different from a hut. That you may do. I put into your hands the proper materials, and submitted them to your commands, as I have proportioned their structure to your conveniency. You employ things already made, without knowing any thing of them but the outsides, without being obliged to argue upon what makes the stone which supports your timber-work, nor upon what makes the slate under which you take your rest. What would become of you,
if

If before using states and stones, you was obliged to study the making and enumerate the principles of them? Your life would be at an end before you would have finished your house. I have used you tenderly. I have treated you as a beloved son, who busies himself usefully under the eye of his father, and who, without making himself uneasy about any thing, finds in his father's house all the helps necessary for his work. Your wisdom then consists in discerning what you can make subservient to your wants, and in managing it with the industry you have received. But did I ever require of you to form the matters which you make use of? And if I have given you them ready made, why would you have me inform you of the structure of them? Such a knowledge would divert you from what I expect from you. My intention was to afford you employment, not to give you distraction. I would only exercise, not over-burden you with needless or toilsome researches. I supplied you with different senses, timely to inform you of the relations of conveniency or inconveniency that might be between you and what is about you. Experience completes your information in discerning good from evil. In this manner I have given up to you the sight and the use of whole nature. But at the same time that I hide from you the structure of the minutest element; you fancy you understand that of the universe. You gather crouds of auditors, and you get into pulpits, to teach them how and of what the world was made.

Come, great architects, you, who from age to age teach others a mechanism you have not the least knowledge of: come, and learn of me how great wrong you do the disciples who listen to you. You mention my works to them, though you commonly examine only that part of them

which I conceal from you. But you hardly mention me to them, though you find my hand, my bountiful hand, and my intentions every where. 'Tis true, my name is sometimes pronounced in your conferences. You even dispute warmly when you speak of me : but you do it to bring my existence in question. You sometimes call me by the name of moving force, or of prime mover. Very commonly, instead of naming me, you only mention nature. It is nature that regulates the order of your days : nature that renders animals fruitful : nature that gives you fruits and flowers. It is nature does all. I have as it were been a stranger in your physicks.

But what was the result of this ? Your disciples have learned neither how to know God nor his works. Instead of making solid people of them, by modestly reducing their learning to what was experimental ; and instead of making their hearts grateful, by shewing them my bounties every where, you have infatuated them with a penetration which leads them astray, by referring them every where to the evidence of their own arguments, and to the clear and perspicuous knowledge of the bottom of things. You are much in the wrong to pretend, that a clear sight or an evident comprehension rules the operations of their minds on every occasion ; since my intention was, that experience rather than evidence should be the measure of their learning ; and since I had given them the faculty of reasoning, not to know the bottom of nature, but to regulate the use of whatever should have been tried and discerned by the testimony of their senses. You have distorted their reason, by diverting it from its object, and by making it think itself endowed with a discernment which I have not allowed it. They, in imitation of you
their

their masters, are become so many idle talkers, who take your systems for the rule of what is to be thought, or their own empty metaphysics for the rule of what is to be believed. You have introduced a dry sort of learning, in which the mind can have no share; since my favours, which you never mention, are with regard to it as if they had never happened, being all referred to one general impression, as so many necessary effects of it. Your pretended learning is besides as needless as a dream, since your systems can no more than a dream be conveyed from your schools into society, or into the laboratories of artificers, to direct their hands in the least of their enterprises.

Setting out all of you with generalities, the first of which is to rake up a chaos of matter to construct a world with, you give your disciples to understand, that by a regular study of the particular pieces that compose the universe, you have methodically acquired the privilege of pronouncing upon the whole. You attempt to explain this magnificent structure, some with atoms of all kinds; others with a substance extended in length, breadth and depth, which being moved divides into three elements. Others have for that purpose recourse to a general matter, out of which they fetch fire, air, water, and earth. I now descend to receive your buildings from you. I come to visit your worlds. I leave you all the liberty of employing your favourite principles, and whatever materials you shall please. 'Tis likely you know which are the secret bonds that constitute the hardness and coherency of the particles of an element. You have a thorough knowledge of the figure of these particles. You know how and of what they themselves are composed. Thence you penetrate even to the ulterior particles that constitute the

body of the foregoing ; and you can with a perfect knowledge decide whether there is or is not a certain term where the composition finishes, and beyond which non-entity is to be placed. By a consequence of your admirable penetration, which discloses to you what is inaccessible to your eyes; you have found out in what two elements agree, and in what they differ. The nature of fire is perfectly known to you. This dreadful element has fixed all its fury for your sake, and is become tractable in your favour. The air is become visible to you alone, and it has revealed to you the mechanism of its springs. None of you is ignorant either of what makes water fluid and fugitive, or of what renders it as hard as a flint. You know the earth, and you may determine why this element being put into the fire, part of it calcines, and the other is vitrified. You at one view perceive what distinguishes mud from sand, sand from clay, clay from stone, and this from slates or diamonds. You have your reasons to decide, why a grain of gold is not as much an element as a grain of earth. Or if experience has not yet favoured you with the division and insight of these principles, you make amends, by the penetration of your genius, for the obstinacy with which that gold refuses to let itself be analyzed : and though no mortal living ever durst say or shew that he had resolved gold into other principles ; you nevertheless assign them with as much confidence as if you had seen them yourselves. You even dare to fix the respective proportions of them, and to determine what is predominant in each metal. It is from you other men are to learn what is elementary and what is composed. After having with subtilty unravelled and found out the principles, nothing has appeared more easy to you than to collect masses, and at
last

last to form the whole. By an extent of genius, ^{The WORLD} which nothing can set bounds to, you with equal ^{of the PERI-} skill find out what enters into the composition of ^{PATETICS.} the celestial spheres, and what constitutes the earth you tread upon: and it was because you knew the universe as well as your own abode, that you have said, I want only such or such materials to complete the work.

You have not been satisfied with being sparing of elements, by limiting them, some of you to three, others to four. You have moreover searched to the bottom the nature of the plenum, of the vacuum, and of motion. Some of you, instead of the four elements, or of the four qualities of hot, cold, dry, and moist, chuse to have a simple and homogenous matter, which they make to move according to certain lines, and which yields without resistance to all your calculations. After these preparations, you may indeed begin your work, and give us a world. I shall even previously put your elements in action, and entertain in them a motion once imprinted.

I understand you. All is done on my part, and I may now retire. The world will be produced without any further interposition of mine. You say you perceive the elements whirl, wearing out at their corners, gathering, separating, fermenting, sinking, clearing up, condensing. These are magnificent words indeed. Doubtless you apprehend the full meaning of them. I patiently expect what you pretend to fetch out of your elements confounded thus pell-mell, or of the mixture of your four qualities. Hours and days pass away. Nothing yet comes out. Ah! what would you expect from such a confusion? Nothing will ever spring out of it better constructed than what would come out of a tun, in which you shall have tossed in your four

elements a dozen times together. A chaos of matter may very well produce another chaos, but never a world. It is asking too much from you. Give us only the body of light.

Look out what the exact temperament of your four qualities is, that may produce the body of the corporeal light on the one hand, and establish an exact correspondence between that light and the globe of the eye which is to receive it, on the other.

Do you think that it is a little motion or an accidental degree of certain qualities that has multiplied the operations of the eye, by suspending it in man by several muscles, and has on the contrary multiplied the eyes of insects, because it has rendered them motionless in these animals? You see that this is the work of a precaution, of a reasoning, of a design; but not of a motion, or of a fermentation: and if you know not how to go about forming the eye or the light, are you not rash to the last degree, in giving treatises upon general physicks, that is, in teaching the architecture of the whole world!

I shall inform you how better to know the extent of your own capacity. Leave the construction of light, which turns your brains, and confine yourself to a flower. Form but a tulip: It wants no smell, and that will be so much trouble spared. Give it me only of a single plain colour. I release you from all mixture and ornament. I reduce your task to the lodging in the box of the pistillum the seeds which are to produce the same plant again, and to the putting at the top of the stamina the reservoirs of dusts which are to render these seeds fruitful.

Tell me, is it now a motion, a sediment, a fermentation, an occult quality, that has united the seeds, and the farinae or dusts in the tulip, while another

another caprice of motion has placed upon the pumpkin two sorts of flowers, one of which contains the seeds, and the other the farina? But how is it possible, that motion, which has still more separated these two things in the palm-tree, the hemp, and the nettle, by putting the seeds upon one stem, and the dusts upon one separate, yet has here, as every where else, been faithful to its system of the seeds and the dusts, which is invariably found in all plants? Does motion or the mixture of the qualities form any designs? Does it propose to be uniform in one point, in reserving itself the liberty of varying in another? Speak; say what it is that has fetched out of your chaos twenty thousand plants, which, notwithstanding their variety, all of them perpetuate themselves by means of the seeds and farinae? Tell me what has united the seeds and dusts in one species, and separated them in another, while they are all produced by the concurrence of these two principles? Tell me again, why, in the concurrence of so many motions that clash with each other, it happens that nature never makes a pumpkin or a melon come out of the seed of a poppy or an asparagus?

Great peripatetics! who have been so long in possession of the schools; own the fact; I here talk a barbarous language to you. These dusts, to which I attribute the fruitfulness of the seed, you have always looked upon them as a needless excrescence, as the efflux of a superfluity: and you thought yourselves to have dived into the bottom of the nature of the seed, when you said after Aristotle your master, that it contained the future plant, not *in act*, but *in power*. Wonderful! You set up for constructors of the world, and you confess that you know not the pieces and parts of it. If you had examined nature instead of making

yourselves the echo's of Aristotle, you would have found, that each grain of these dusts, which you look upon as an excrement of the flower, is of a structure as well organized as the flower itself, and in each species is of a figure as constantly the same as the flower that bears it.

Let us still diminish your task. Instead of a tree or the bulb of a tulip, make me the smallest gnat; nay, something still less, the minutest of worms. You say a small quantity of mud heated, or the least putrefaction, is sufficient for that: and lest I should again accuse you of speaking without having consulted experience, you loudly boast of having experience on your side. You confidently assert, that experience taught you, that the mud remaining on the plains of Egypt, after the draining of the waters of the Nile, no sooner feels the action of the sun, but innumerable swarms of gnats spring out from the concurrence of heat and moisture. If then the heated mud may ingender bodies so regularly organized as those of insects are, (a point which you are very sure of) the chaos of the four elements, and the four qualities, may very well have ingendered the heaven, the earth, and all that they contain.

I let this argument of yours pass; and in your favour I at once give up the immense distance that is between a vile insect and the machine of the universe.

You have for these many ages very earnestly taught, *That the corruption of one being is the generation of another*; and that a small bit of rotten wood cannot fail being converted into a living creature. You have even in your writings published receipts containing the several species of animals, the fleshes of which must be used infallibly to produce such or such insects. To be sure, you must

must have seen the thing, to speak in this manner ; *The WORLD of the PERIPATETICS.*
and the first benefit you can reap from this experiment is, to learn, that particles of matter moved and turned up many ways produce bodies organized. If therefore a particle of mud ingenders a fly or a small worm, the chaos may ingender the light, the sun, and the whole world. It is no small glory for you naturalists, to account for every thing without having recourse to God. You will be able for the future to do without me. Let us then go and see your insect hatched, and give your philosophy an opportunity of obtaining a complete victory.

Come with me to the plains which the Nile waters and improves by its overflowings. This is the place you commonly chuse for your experiments. I shall chuse no other. I have ordered the river to retire again within its banks. I have sent a south-wind to assist the ebbing of the water, and hasten its arrival at the sea. My sun is risen : The mud gathers heat upon the plain. Behold here heat and moisture together. Here are fermentations and motion. I have collected and put into your hands all your forming principles. Let us now work, you on your side, and I on mine. You, Aristotle, Empedocles, Averroes, and many others who know exactly what enters into the composition of the wing, and the trunk of a gnat, begin your work. Fetch out of the water a small quantity of tempered mud : put it in an open vessel, and expose it to the air. Introduce the rays of the most burning sun thereinto, in order to hasten on the wonderful fermentation. The only precaution you are to use is, to cover the vessel with a fine gauze, lest a mother coming to lay her eggs in your mud, should rob you of all the satisfaction you expect from

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from your experiment, and appropriate to herself the generation with which you intend to honour corruption. In like manner, take a fish, or the flesh, either of a water fowl or another bird. Expose it in the same manner to the sun, and cover it with a thin cloth. You have every thing at your will: heat, moisture, free air, corruption, dissolution.

But how! All remains dull and lifeless under this gauze. The flesh grows sour, and hardens like parchment. The mud dries up: the parts of it contract; and there are neither flies nor worms to be seen.

Now compare my work with yours, and see if it is possible to separate the formation of the minutest organ in the universe from the wisdom and express command of the Everlasting. I work differently from you. I have put in the ovarium of a mother the small egg which contains the worm, whose formation you have missed. I have shewed this mother the place that would be fit to afford her little one its proper foods. Expose to the sun a fish or any other animal you shall have killed, and leave the access to them free. In a few hours you will see the fruitful effects of the care which the flies have taken to lay their eggs upon them. You ask whence the insects proceed which you see swarming in the waters stagnant upon the plain, while the mud and water of your vessels have not been capable of ingendering any thing. I told the gnat, that the ditch water would facilitate the unfolding and nourishment of her little one better than running water. Accordingly, the mother has laid upon the most muddy water her minute eggs, wrapt up in a glutinous matter, that hinders the water from insinuating into them. I make use of the fire and the air, to put in action the
vital

vital principles which I have prepared in the egg. My hand has lodged under that arch a capsula or box of a prodigious smallness, which contains the animal for the sake of which all is made. This capsula is encompassed with liquors, that will at first nourish the little one, and which fill up under the shell a space a thousand times larger than he himself. All these preparatives have been fashioned a long time before. The limbs of the animal already formed, but benumbed, advanced towards the day by increases, whose progresses are inconceivable to your understanding. I have known through the series of all ages, on what day and at what moment he would break through all his tunics, and become of the number of the living creatures. By these precautions, and by the inequality of the unravellings of these minute beings it is, that I insure to all ages the preservation of each species.

*The WORLD
of the PERI-
PATETICS.*

Ye all of you think my majesty disgraced by these productions, and you chuse to ascribe it to some cause which you term a second cause. You are indeed very far from truth ; and your taking thus from me the generation of this minute insect, is a theft that gives me offence. It is transferring to a parcel of mud, or to a blind motion, a power and a glory which I have not granted to man, though he has had intelligence and council at his command. No motion, no creature whatever, can form the skeleton and vessels which organize an animal. Much less can they give him life. This is the character of my handy work. Now look upon the small worm which you expected. It has broken through the shell of its egg. It has shaken off its swaddling-cloaths, and your eyes, if you look close, will easily perceive it.

How now ! you say : It was a gnat which we expected should proceed from a gnat. It is very plain,

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plain, that generations are not regular. Here is the egg of a winged animal that gives us a small creeping worm. It would have given us a gnat, if it had experienced another temperament of qualities ; and matter doubtless organizes itself under one form, then under another, and so on according to the degree of heat that makes it ferment.

But you still refer every thing to your own notions ; and for want of following my works step by step, your knowledge is a mere heap of words without meaning ; nothing but empty noise. Let the sight of the progress of the birth of the gnat put you out of conceit with your own frivolous principles.

Our small water-worm, which you have too slightly abandoned as an animal which was not what you wanted, lives a while in this water. I here mention nothing to you of the foods I prepare for him, or of the many utilities I designed to procure you by his ministry. Your ungratefulness is not at present what I insist upon. Follow this insect through the several scenes of his life. When it is sufficiently fed and strong, I take from him all liking to food. I give him convulsions which affect him. The inward efforts which agitate him, break the case that covers him. The skin of the worm he is wrapt in is torn off. Another animal comes out of it, which is itself nothing but the sheath and envelopement of a third, that is, of the gnat, the birth of which you expect.

You are surpris'd at my having used so many cautions and measures to bring so small an animal to light. At least you confess, that you understand nothing either in its birth or structure ; and that whoever understands nothing in it, has no right to decide, that it is the production of a chaos of principles, or a mixture of qualities. Leave your systems.

systems. Be not learned ; but look out : and let experience be your instructor and your guide.

*The WORLD
of the PERI-
PATETICS.*

You are at a loss to know what I intend to do with the gnat, which I, with so much care, bring to perfection, and for which I have prepared so many shelters. Conclude not, when you don't perceive the design of my works, that they are needless ; but rather, that you know not every thing : and instead of blaming the measures I take to secure the birth of that gnat, judge rather of its destination and utility from the cares I bestowed on it. What is to follow will teach you, that, by feeding the fish, this small water-worm nourishes you yourself. I afterwards give him wings and fruitfulness ; that he may go and enrich other places. And these metamorphoses, which you looked upon as sports of nature, or as the result of corruption, are, as you ought to see, so many instances of my liberality. Nor do you know there want sufficient proofs of a wisdom which extends to the very minutest particulars: so far are you from being able to take from the All-wise the formation of the universe itself. What other cause than a profound wisdom, and a special order, can have made the birth of the gnat to depend from a pre-existent egg ; fetch a worm out of that egg ; tear the robe of the small worm, to bring to the surface of the water the chrysalis it contained ; and at last from under this second cover dispatch a winged animal, provided with an innumerable multitude of new eyes, and having a heart, lungs and intrails different from those which served him already ?

Would you know how dear this gnat is to me, and again receive from him instruction more solid than that which you give your disciples ? Pierce a thin plate of lead with the point of a needle ; and having introduced into the aperture a
drop

drop of water remaining globular therein ; present the head of the gnat very near this drop : your eye will there see, not without surprize, the object considerably larger. Pray do you think it is a wisdom and an exprefs will that has taken care to sharpen the sword, and indent the saw which you see coming out of the trunk of that gnat ? Go now, and fetch the heaven, the light, and the sun, from an unformed mass of primitive matter.

Amongst the pretended sages that study my works, and who are always afraid of meeting me, I find some not so positive as Aristotle, but who are neither more reasonable nor more religious than he. They construct not the world ; but they criticize upon it. Their only skill is to murmur and complain. Instead of making the lights and blessings which I grant them subservient to my glory, they take a pretence from what they do not conceive, to cast scandalous doubts upon my very existence. I have admitted them all to a banquet, wherein in favour of them I have lavishly collected a world of delights : and instead of being grateful for what I grant them, they lose their time in quarrelling with the dainties which I thought not proper to set before them. I have lodged them in a magnificent palace. They look with an eye of pity upon such of their fellow-creatures who seem to be affected by my favours ; and they presume to set up for controllers of my house, so far as to find fault with the œconomy and government of it. What are those insects good for, they say, which rising from the plains of Egypt shall go and devour part of the riches of Africa ? To what purpose is the caterpillar made to creep for months together, while wings are given to the butterfly that proceeds from it, to live only a few days, and often less than four and twenty hours ? Why so many
prepa-

preparatives for animals either noxious or need-
less?

*The WORLD
of the PERI-
PATETICS.*

Proud logick-choppers! I hear your murmur-
ings, or rather your blasphemies. All the pieces
of wisdom, and the innumerable blessings whereby
I have tried to busy and affect your minds, ought
to have persuaded you in silence to adore what I
hide from you, or what you have not yet discovered,
though I had invited you to the knowledge of it.
But know that my will, which has framed the
structure of the universe, is also the express cause
of your evils (*a*), or of the œconomy you so much
complain of. The small water-worms that proceed
from the gnat, are the food of the young fish; and
the caterpillars, to which the butterfly gives birth,
are the food I send to the young birds. These
insects have still in my purposes other important
appointments. But if they were able to ingender,
they would perpetuate themselves in the place of
their birth, and there corrupt every thing by an
excessive multiplication, while the other places
would be destitute of the advantages which man
reaps from them without knowing it. So long as
the insect is a creeping worm, I leave him in a state
of barrenness. But I have within him prepared
another animal, which has received both wings
and fruitfulness. Life is no longer necessary to
him, so soon as he has dispersed the eggs which
you deign not to take notice of, and which are
treasures out of which I fetch sometimes wholesome
foods, when I moderate the quantity of them;
sometimes instruments of anger, when I permit
them to multiply more than ordinary.

A legion of caterpillars this year ruins the ver-
dure of gardens. Your philosophy is disconcerted:

(*a*) Here moral evil is not meant, which is the work of a
corrupt will.

men

men will perish with misery next summer. Who knows but the corn shall be the prey of this breed, which will perpetuate itself from year to year in the country, and lay every thing waste? Great philosophers, who are able to construct the universe with three or four elements, and to whom a little mud is sufficient to produce living animals! Why are you not able to fetch out of the whole world, out of the world which is already made, a remedy to stop the swarms of the caterpillars, when I shall be pleased to send them on your plants? Be not alarmed. Both the evil and the remedy are in my providence only. I shall command the wind, which will carry away the butterflies and the eggs at once into another country, where they shall do no other mischief but what I have fixed the destination and measure of. The philosopher, who has not seen the arrival or the passage of these insects round his habitation, will be there surprised to see certain plants all on a sudden covered with a kind of insects, either intirely unknown, or which was not seen there the foregoing years. He will infallibly have recourse to fermentation, to a malignant air, to the mixture of heat and moisture. It will be the fog or some wind that has on a sudden ingendered and caused a shower of caterpillars: all words as contrary to experience and as void of sense as these; *The chaos has ingendered the world. The mixture of the elements has formed the universe.*

It is again the same mistake and the same injustice that makes you every day say that slovenliness ingenders mischievous animals. You think me dishonoured by such a creation; and the habit you have contracted of attributing to corruption the organization of an animal, leads you astray as to the cause of the universe itself, whose œconomy
and

and birth you attribute to a chaos, a motion and qualities altogether imaginary. Shake off this capital error. Yes : the creation of a gnawing insect is as well the work of my counsel as the creation of the horse and the elephant. I vindicate it with as much jealousy as I do that of the whole world. And pray don't you forget what I have granted to you, *viz.* that the chaos may very well have formed the world, if what perspires from your bodies is capable of organizing a flea, or the smallest of worms.

The world of the PERIPATETICS.

These several enemies, which secretly devour your walls and furniture, or whose biting you apprehend, have no other cause of their creation but my will, as they have no other cause of their unfolding and good plight of body but your own negligence.

Rats, mice, bugs, weevils, &c.

There are some to the excessive multiplication of which I have opposed the vigilance of an animal full of tricks, which I send after them. But these and all the others find their well-being in the cleanliness which infects your bodies or your apartments, and which may be the death of yourselves. The attacks of these enemies are then wholesome warnings of the danger you are in ; and in being perpetually in pursuit of them, you either dissipate or prevent that uncleanness which would be more fatal to you than they are.

Thus the learned have in their physicks and in every respect avoided busying themselves with my bounties, and to improve them, to know my intentions, and to praise me for the same ; which was however of all employments the most capable of rendering them happy, and the whole intent of the understanding I had endowed them with. On the contrary, they have attempted with this portion of intelligence to comprehend, nay, even em-

phatically to explain the architecture of the world, which I had not revealed to them. But since the many ages that these lofty spirits promise us nothing but learning, evidence, and light, they are incessantly stopt by the thorns which I throw in their way. They perceive none but false glimpses, and without end multiply difficulties and disputes, by all of them taking their own reason for the rule of what they are to think or believe. Whereas I from age to age grant new successes and new discoveries to those who confine themselves to the simplicity of experience, and who are contented with being sensible of the excellence of the goods and truths which I reveal to them, though I still defer letting them into the intelligence of the same.

VI.

The world of Epicurus.

HITHERTO Aristotle and his numerous family have said nothing to us that was intelligible, and that is not actually contradicted by experience. Here is another Greek whose system has made a still greater noise in the world than the elements and the four qualities of the peripatetics, even Epicurus. This philosopher revived and amplified the doctrine of the atoms imagined by Moschus of Sidon even before the Trojan (a) war, and under different forms introduced into Greece by the Ionian school, Leucippus, and Democritus of Abdera. The system of Epicurus has been faithfully and nobly exposed in the poem of Lucretius. The reputation of these so famous men gives room to expect something very magnificent and satisfac-

(a) According to the opinion of Posidonius quoted by Strabo, *Geogr. lib. 16.*

tory. Here follows the substance of this system, such as we find it in the Latin poem (b), and in several passages of Tully *, where it is mentioned. The WORLD
of EPICU-
RUS.

The world is of modern date, and every where full of proofs of its newness. But the matter it is composed of is eternal. There has been always an immense and indeed infinite quantity of atoms or corpuscles, hard, crooked, square, oblong, and of all figures, all divisible, all in motion, and striving to come forwards, all descending and traversing the vacuum. Had they always continued to move in this manner, there would never have been any assemblage of them, and the world would not exist. But some going somewhat obliquely, this slight declination caused many of them to lie closer, and packed many of them together. Hence were formed several masses; a heaven, a sun, an earth, plants, a man, an intelligence, and a liberty. Nothing has been purposely done. We must with great care shun the opinion, that a man's legs were made on purpose to carry the body from place to place: that his fingers have been provided with articulations, in order to seize what would be necessary for him; that the mouth has been furnished with teeth to grind the foods, or that the eyes have been skilfully suspended upon supple and pliant muscles, to be able to turn nimbly, and to see on all sides in an instant. No: It is not prudence that has disposed these pieces that so they might serve us: but we make use of what we find capable of doing us service. * De fini-
bus, lib. 1.

— *Neve putes oculorum clara creata,
Ut videant; sed quod natum est id procreat usum.*

(b) T. Lucretii Cari de rerum natura, lib. 6.

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The whole has been executed by chance. The whole continues, and the species are perpetuated by the same chance. The whole one day or other shall be dissolved by chance. And to this amounts the whole system.

Is it then possible, will my readers at first say, that men have procured themselves a name in the world, and in the modern world too, by uttering such sillinesses? We imagined at the reading of this article, that we must be armed with all our reason and religion to hear the Epicurean doctrine exposed: but it proves a system fitter to set us a laughing than to give us scandal. For no-body was ever shocked at hearing the systems which are made in Bedlam; and those who quote them have ever been excused making a refutation of them. It must be owned, that when we meet with people capable of thinking thus, there is nothing to be said to them. It would even be needless to send them a physician to cure their brains, as the inhabitants of Abdëra did to Democritus, one of the first authors of this extravagance. The disease of this kind of philosophers is a gangrene beyond the power of physick.

VII.

The world of Gassendus.

BUT let us by no means range the Epicureans and the Epicureists in one and the same class. The latter are the atomists, who have Gassendus (*a*) at their head, and who making God the only author of the atoms and of their motions, imagined they could, by the union and disunion of these primitive

(*a*) Archdeacon of Digne, and royal college, born Jan. 22. professor of astronomy at the 1592. N. S. died Nov. 9. 1665. corpuscules,

corpuscles, account for the perpetual changes of ^{The WORLD} the world. They are in point of religion free ^{of GASSEN-} from all reproach. But not wholly so with re- ^{DUS.} gard to reason. They, like many others, had the infirmity of longing for a system that might enable them to explain all ; as if the quality of philosopher supposed a faculty of understanding every thing, and laid a man under an obligation of accounting for every thing. They have attempted to refer to physical causes what can be attributed to nothing but the special will of the Creator. Their atoms moved, and grasping one another in the vacuum, may very well form mixt bodies. But being of all sorts of figures, they cannot form the elements, or those simple bodies whose nature is determined, and altogether invariable. Nor can they by the impression of a general and uniform motion produce the lineaments of any organized body, because the structure and use of organs are the work of prudence and an intention ; whereas motion has neither intention nor prudence.

If the Gassendists should say that God has at first created particles of gold in a determined quantity, and likewise a provision of parcels of mercury, a number of particles of silver, of sand, of fire, and many others ; that the concurrence of these corpuscles produces masses of gold or of sand when they are all of the same kind ; or mixed bodies, when of different natures ; or organized bodies, when God by a special act of his will chooses them to assist the growth of the bodies he has organized by an express command ; this philosophy would be acceptable, because it would prove agreeable to experience : in which case we might shake hands with the Gassendists, because it is no longer building a system : It is recounting

what God has done, without undertaking to explain it.

But the Gassendists, to make gold, employ the same corpuscles that might before have made a mass of crystal. In which they go against the evidence of facts, which shew us that these substances are unalterable. Likewise, if they think, as they but too much do, that their corpuscles moving circularly or directly, shall be able to form a sun capable of enlightning the earth, an earth fit to nourish inhabitants, and animals proper for several functions, it is attributing the admirable organization of the world, and the œconomy of each of the pieces it is composed of, to a motion that can do no more than forming or disuniting rough masses, without any precautions or destinations. Nothing but the will of an equally powerful and wise being can possibly have given the simple elements their immutable nature, and organized bodies their special œconomy.

To say that a mass of gold is a collection of particles of gold drawn near to each other, and that these particles are an original nature, an immutable element known to God alone, we want neither crooked nor square atoms. Upon what foundation should we have recourse to, and what instruction is to be fetched from them?

To say likewise, that the body of man is a texture of small and great vessels, whose diminutions and sortment, or intimate correspondence, is known to none but God: that these vessels are composed of several elementary particles, wonderfully mixed together; that in short these elements are permanent natures, which God has made to vary the mixed bodies, and at the same time to set bounds to that variety; in all this we need no ways have recourse to the atoms. They would confound every

every thing, and are no manner of assistance to us. They are words as vague, and generalities every whit as little luminous, as are the substantial forms or the occult qualities of the ancient school. The atoms of Epicurus of course deserve nothing but to be laughed at; and those of Gassendus either are no sort of information to us, if God fixes the nature and use of them by special acts of his will, or lead us to irreligion, and dishonour reason, if we pretend to fetch any thing regular and organized from them without an express command of God.

*The world
of Des-
Cartes.*

VIII.

The world of Descartes.

I M O S T sincerely value Mr. Descartes, not indeed on account of his being a Frenchman, (for all men are my brethren) but because he is a very great genius, and still more, because he was the first who encouraged us to shake off the yoke of Aristotle, and to look out for a better method of pursuing sciences, than that which was followed heretofore. I should have a far greater value for him, if after having convinced himself that the beaten path led to nothing, he had not engaged in another road as little sure, and perhaps more dangerous. The regard I owe to truth and my readers obliges me here with candor to speak my mind of the method of Descartes, and of his world, which is the product thereof. The reader from the exposition of his sentiments will be sensible, that man was not born to argue in this manner.

* Descartes, either from persuasion or out of œconomy, began by doubting of every thing. He was no longer certain whether there was the least thing

* The method of Descartes
See his meditation

thing about him, or whether he himself existed. Then making profound reflections upon what passed within him, he became sensible, *That he was thinking*; whence he concluded, *That he existed*. After this important discovery, which gave him great satisfaction, and which he took care to maintain by a number of writings, against any that should attempt to contradict him in that point; he went on further, and found out, that he, Descartes, who was thinking, had likewise a body. This he made himself very sure of. Having gradually convinced himself of the existence of his feet and hands, he philosophically made use of them. By little and little, and after repeated trials, he next found that there were some other bodies round him. At first he would not believe it. He must previously be convinced of that; and he was very far from thinking himself sure and fully informed of it. How did he know but he might be seduced by a dream? God, or some powerful being perhaps imposed upon him, by the appearances of things that did not exist. From one syllogism to another, from demonstration to demonstration, his argument at last led him so far as to know flat and plain, that he, Descartes, was not asleep when he was awake, and that God did not impose upon him by fallacious appearances. He was so transported with the evidence of these new discoveries, and of the coherency of his own ideas, that he with all speed imparted them to all Europe, and thought himself authorized to refer the whole of philosophy to one single maxim, *viz.* never to admit any thing but what we evidently conceive. Next to which he undertook to explain the structure of the whole world, without admitting any thing therein, that he did not conceive with the utmost evidence.

The first reflection which offers to the mind concerning this method so much cried up, is, that there is no peasant, be he ever so stupid, but knows very well, without either method or meditation, that he exists ; that he has a body ; that there are other bodies about him ; that he is not asleep when he is awake ; and that God, as he is good, does not make sport with him. If you dispute this peasant's being very sure of his own thoughts concerning this, he will not retire to a solitude to prepare you a reply. He will laugh in the face of his antagonist, and not bate him an inch. Why then are these discoveries so lavishly exalted ? Why must we be made to find out with so much apparatus what we knew perfectly well without this luggage of syllogistical demonstrations, and which we know not one whit the better, for having proceeded in this case with the most profound meditation ?

In the second place, Let all the notions we have of our own thoughts and existence be ever so distinct and certain within us, yet are we not thereby authorized to think, that God, who endowed us with a certain portion of knowledge, on that account invites us to attempt to know every thing, and from one discovery to another to arrive at penetrating into the structure of his world ; and to admit nothing but what we clearly and evidently conceive. A sensible knowledge under the government of reason, is a sufficient guide to us in our conduct. Our present state requires nothing more : and experience shews us, that such is the rule God prescribed to himself in his conduct with regard to us.

If a man born blind had a mind, by the advice of some Cartesian, to make himself amends for the privation of his sight, by the satisfaction of studying

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ing physicks, and improving his own lights, that man would be in the case Democritus once wished himself in, that he might be able to dispose his world with greater liberty and repose. He would be in the case all the meditative philosophers have been in, who thought they should know the œconomy of the universe and its parts better, in proportion as they should with care keep their eyes exactly shut, that they might meditate with freedom. The man, whose reason is not diverted by the tumult of sensations, doubtless ought to go from one discovery to another. The flambeau of evidence likely will unveil every thing to him. It will unveil nothing to him in fact. Our blind man will frame a system to himself full of chimæra's and illusions, because it is absolutely impossible, without the help of sight, to have any just idea of the sun, light, or colours, that is, of those parts of nature which are the beauty and chief merit of it.

Hitherto reason is very far from being sufficient to enable our blind man to learn physicks. Nor will the evidence of his own arguments make him amends for the loss of his eye-sight. Let us now suppose that God should grant him the enjoyment of it. Our faithful disciple of evidence will with amazement behold the spectacle of the universe. This is quite a new revelation to him. A single cast of his eyes is to him a greater information than a million of arguments. His knowledge is then increased by the addition of a new sense. But he learns nothing but what his eyes shew him, and his reason is always confined within the same bounds as to the structure of the whole, the organization of the species, the causes or mechanisms of the springs that put all in motion, and the exact nature which distinguishes an elementary particle from

from another. 'Tis true, the outsides and mutual relations of the parts of the universe are much more sensible to him. He admires how God has been pleased, by the action of the eye, to shorten the researches and trials which must otherwise have been made on the nature of the things that were to serve us. But has his reason, guided by this new sense, procured him a greater facility and privilege to comprehend every thing? Can he with that help penetrate beyond what is sensible? Can he go beyond the outsides, and find out any thing besides mere relations?

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Nay, if he is even resolved to go on upon the principle that was so much recommended to him, *viz.* not to consent to any but evident truths, and to reject whatever implies any thing; this man ought to be persuaded that he sees no sun, no colours, nor any extent in the objects that strike his eyes. For there is nothing but absurdity and contradiction in all this. Can he with evidence conceive how his eye may be affected by objects that do not touch him? Is it not absurd to think that a spirit may be modified by bodies? Is it not a palpable contradiction to say, that a small being a few feet in extension, may receive in him the sentiment and measure of a large plain, and of the distance which is between the heaven and the earth? Thus our blind naturalist, both before he could see, and since he has seen, has found in his reason nothing but perplexity, darkness and incapacity of knowing any thing of what surrounds him. It is the same with all the researches of the partisans of evidence in point of physicks. They either regret their time lost, or espouse systems altogether unintelligible. What is the source of the evil? Even the fallacious principle that was given them for a rule, *viz.* never to admit any thing but what reason seizes with evidence.

dence. This principle was given them under the tacit supposition, that in order to acquire some knowledge, our senses must be neglected, and reason alone be listened to. But this is neither the order nor the method of God. The manifest intention of the Creator, in giving us senses and reason, has been to make us obtain all sorts of knowledge by the ministry of our senses, and to regulate the use of these by reason. But men generally do quite the reverse. They make their senses the rule of their conduct, and their reason the standard of the knowledge of nature. This is perverting all the gifts of God, and pretending to apply them to a use for which they were not designed by him. Such a method of arguing will never make any but extravagant, presumptuous, or incredulous people, who will refuse to admit what is best attested, because their own little reason will not find evidence in it; and who will mistake for evident ideas systems contrary to experience. Such a method is pernicious and illusory, because it supposes, contrary to an universal experience, that God has called us to an evident knowledge of the bottom of his works, and of the reason of every thing. His conduct with regard to us, strictly speaking, is the reverse of the supposition. God acts in a manner perfectly uniform in what he has taught us by revelation, and by the sight of nature. In faith, and in the sciences, he acquaints us with certain facts, and informs us of certain truths. He, either by our eyes or our ears, and from faithful testimonies, makes us certain of such or such matters of fact, which, after that, we can no longer reasonably question. He instructs us in certain truths, of which he shews us the relations and proportion with our wants. He lets us into that part of them which is sufficient for us; and

and it was in order to make us sensible of their excellence and use, that he has indowed us with understanding. It was in order to enable us to regulate our own conduct, and to improve the use of all his creatures, that he has inculcated on that understanding the principles of morality, the principles of reasoning, and those of mathematicks, which are always ready to serve us, in proportion as we are mindful of cultivating and making use of them. But he has by those few lights he is pleased to grant us, spread a darkness truly impenetrable to our understanding. We have in another work (a) endeavoured to evidence the profound wisdom and wond'rous goodness of this conduct of God. But though we should perceive no more than the motives of it, it is enough for us to know that he governs us after this manner. Who will dare to say to him, Why didst thou make me thus? Who will dare to drop any complaints? The Cartesians, in constantly recalling man to the penetration of his own reason in order to know the bottom of nature, and by incessantly preaching to him the necessity of looking for evidence in every thing, have given us man for quite another being than he is, and have regulated the obligations and operations of his reason upon a power not granted to it. A clear knowledge of the bottom of beings is not its province here below : nor is it ignorant of its having another rule to follow. The principle which has ever guided and for ever will guide all men, and the philosophers themselves whether they will or no, is this : *We must with gratitude receive, and to the best of our power improve whatever is testified and ascertained by experience, though we do not conceive it.* This principle, which is inseparable from common sense, and

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(a) Letters that conclude the first and third volumes of the *Spectacle de la Nature*.

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which men do more or less put in practice, even without knowing it to be a principle, is at the same time the basis of all arts, of sciences, and of faith: It is equally fit to make excellent christians, excellent philosophers, and excellent handicrafts. It might be expressed in fewer words, thus: *Prove all things, and hold fast that which experience shews you is good* (a).

In the exigencies of life, as well as in the affair of our salvation, we every day go, not indeed by the clear knowledge of objects, or by the evidence of what they are in themselves, but by the experience of the uses they may be applied to; by the testimony of the excellence we have observed in them; in short, by reasonable motives of credibility, to fix our judgments, and to behave accordingly. The jesuit's bark cures fevers. Must we, before we use it, have a demonstration of the manner in which it cures them? The sea-compass carries us to the Indies: must we, before we go thither to fetch cotton and spices, evidently know by what mechanism the magnetical atmospheres may repel, attract, and direct the iron offered to it? A pound weight of water lying upon a basis of a square foot, weighs or acts as powerfully as a cubical mass of water of seventy pound weight: Who shall be able to give us evident proofs why it should be so? The great Paschal was contented with the matter of fact *. The whole earth raises our admiration, and gives us transports by its beauties and services: but we know not the least piece of it. Religion likewise strikes us by its proofs, affects us by the proportion of its objects to our wants, and raises our minds by magnificent hopes. But it has, like all the rest, a dark side, inacces-

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(a) *Omnia probate: quod bonum est tenete.*

1 Thess. 5, 21.

sible to our intelligence. What rashness is it here to require that God should reveal to us the bottom of his work, and before the time spread a plenitude of evidence thereupon, while he still makes a secret to us of the nature of the drop of water that refreshes us, or of the ray that gives us light !

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If it is notoriously experience, and not an evident knowledge or an intimate comprehension which must be the rule of what we are either to admit or reject, the world of Descartes, even before its being examined, is totally demolished. Who can patiently hear say, that God has given us a penetration capable of finding out the structure of the universe, and the bottom of the mechanism of every piece, while this pretended penetration indeed and indeed remains void of power in each of us, whenever we have a mind to try it upon the mechanism of the minutest vessel of a plant, or of the smallest of the muscles that assist the motions of our eye? Let us however view the Cartesian edifice. Let us not indulge any disposition to criticising. Let us do justice to the genius of the architect. But let us compare his work with that of the Almighty ; and let experience alone decide, whether the building of the man has any resemblance with that of God. Mr. Descartes and his followers both ancient and modern, without denying that the world was made in six days, by special wills which assigned to each being its nature, place, and function, as we are taught by the Holy Scriptures, say, that the world, with all we see, may have been made by virtue of a simple law of the whirling motion imprinted upon matter. As they pretend that this possibility is sufficient to them to account for every thing : it is this possibility we are now to examine.

Mr,

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Mr. Descartes in his treatise upon light, transports his reader beyond this world into the extramundane space; and there he supposes, that God, in order to let philosophers into the structure of the universe, is pleased to gratify them with the spectacle of a creation. He for that purpose makes a multitude of particles of matter all perfectly hard, cubical, or triangular, or simply angular, or even of all figures; but strictly applied one to another, face to face, and so perfectly close, that there is not the least interstice between them. He even pretends, that God, who created them in the extramundane space, cannot after that let any the least space void of body subsist between them, and that the undertaking to procure this vacuum is beyond the power of the Almighty.

2. God next to this puts all these particles in motion. He causes most of them to turn round their own centre; and he besides pushes them in a strait line:

3. God commands them to remain each in its state of bulk, shape, swiftness, or rest, till they are obliged to change either from resistance or by fracture.

4. He orders them to share their motions with the particles they meet, and to receive motion from the others. Mr. Descartes gives as good an account as he can of all these motions and communications.

5. Finally God commands all the particles moved by a progressive motion, as long as they can, to continue to move in a strait line.

This being supposed, God, according to Mr. Descartes, preserves what he has done, but does nothing more. The Chaos thus coming out of his hands, is ready to put itself in order by an effect of motion, and to become a world like ours:

A world

a world, in which, though God has put no order or any proportion, all the things, both general and particular, which appear in the true world, shall be perceived. These are Mr. Descartes's very words: nor can too much attention be given them.

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From these primordial particles unequally moved, which are the common matter of the whole, and altogether indifferent as to becoming one thing or another, Mr. Descartes first sees three elements spring, and from these three elements all the different pieces which are perpetuated in nature. First, the corners, angles, and extremities of the particles are unequally broken by the friction. The finest pieces are the *materia subtilis*, which he calls the first element. The bodies worn out and made round by the friction, are the second element, or the light. The grossest among the broken pieces, the most massy shards, and those which preserve the greatest number of angles, are the third element, or the terrestrial and planetary matter.

All these elements moved and being obstacles to each other, mutually force one another to advance, not in a strait, but a circular line, and to move in vortices, some round a common centre, others round some other; in such manner however, that preserving always their tendency towards going in a strait line, they every instant strive to recede from the centre; which he calls centrifugal force.

All these elements endeavouring to recede from the centre, the more massy among them are those which recede most from it. The globulous element therefore will be more remote from the centre than the *materia subtilis*; and as all must be full, this subtil matter shall take its place, partly in the interstices of the globules of the light, and

partly about the centre of the vortex. This portion of the subtil matter, that is, of the finest dust, which has taken its place at the centre, is what Mr. Descartes calls a sun. There are like masses of fine dust in other vortices, as well as in this; and these collections of dust are so many other suns, which we call stars, and which, on account of their remoteness, exhibit but little splendor with regard to us.

The globulous element being composed of unequal globules, the greatest recede most from the centre towards the extremity of the vortex, and the smallest keep nearer the sun. The action of the fine dust composing the sun, communicates its agitation to the adjacent globules, in which the light consists. This agitation being communicated to the globulous matter, accelerates the motion thereof. But this acceleration diminishes in proportion as the remoteness increases, and it wholly ends at a certain distance. The light from the sun to that distance may then be divided into several strata, whose swiftness is unequal, and diminishes from one stratum to another. After which the globulous matter that fills the immense remainder of the solar vortex, no longer receives any alteration from the sun: and as that considerable remainder of globulous matter is composed of the strongest and biggest globules, their activity always increases from the term where the acceleration caused by the sun expires, till they meet the neighbouring vortices. If then any massy bodies fall into the globulous element, from the sun to the term where the action of that star finishes, these bodies shall be moved quicker near the sun, and less quick in proportion as they shall recede from it. But if any massy bodies are conveyed into the rest of the globulous matter, between the term of
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the solar action and the meeting of the adjacent vortices, they will proceed with an acceleration always increasing, so as to sink into these neighbouring vortices; and others rushing out of the next vortices into the globulous element of ours, might descend or fall into it, and proceed towards the sun.

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Now, there are small vortices of matter, which may revolve in the great ones; and these small vortices not only may be composed of a globulous matter, and of a fine dust, which being at the centre, make them so many small suns; but they may also contain or meet many parcels of that coarse dust, of those large shards of broken angles, which we have called the third element. These small vortices infallibly will carry all the coarse dust towards their limits, or, if you like it better, in other words, the large shards forming massy collections and large bodies, will always, by the superiority of their centrifugal force, get to the extremities of the small vortex. Mr. Descartes stops them there, and this to be sure is mighty convenient. Instead of letting them wander farther by their centrifugal force, or of hurrying them away by the impulsion of the matter of the great vortex, he makes them darken the sun of the small one. They by degrees form several crusts round the small vortex; and of all these crusts thickening all over the outside, is formed an opaque body, a planet, an earth fit to be inhabited. As the collections of the fine dust are so many suns, the masses of the coarse dust are so many planets and comets. These planets being conveyed into the first half of the globulous matter, revolve with a celerity, which always diminishes from the first of them called Mercury to the last named Saturn. The opaque bodies which are thrown into the se-

cond half, get quite into the next vortices, while others, leaving these, descend into ours towards the sun. The same massy dust, which supplied us with an earth, planets, and comets, by virtue of motion, assume several other forms, and give us water, the atmosphere, the air, metals, stones, animals, and plants; in short, all those things, *both general and particular, which we see in our world*, whether organized or not.

There are still many other parts to be visited in the Cartesian edifice. But what we have already seen is a sortment of tottering incoherent pieces; and, without seeing any more of it, every one will be sensible, that a work of this kind is acceptable upon no account.

1. First, it is odd enough to hear any one say, that God cannot create and cause to approach each other a number of angulous bodies, without having something to fill the interstices of the angles exactly with. Why should we presume thus to set bounds to the supreme power?

2. But let us admit that Mr. Descartes knows the exact reason why God must needs have such an abhorrence for a vacuum. Let it be granted, that he can well make the liberty of motions agree with a perfect plenum. The point on which I shall stop him, is his pretence that a vacuum is impossible: nor is it even so on his own supposition; for in order to fill up all the interstices, there must be dusts of all shapes that come timely and get into the open interstices. These dusts are formed only in a length of time. The globules are not instantaneously made round. The biggest corners are first broken, then the smaller; and, by repeated frictions, we possibly shall collect enow of our pulverized pieces to fill up whatever we shall please. But this pulverization is successive.

five. The first moment therefore God shall put the particles of the primitive matter in motion, the dust is not yet formed. God makes angles to rise. They will soon begin to be bruised: but, before the thing is done, there are an infinitude of empty spaces between these angles, and nothing is provided to fill them up.

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3. But let not an absolute plenum make any difference between us and Descartes. If the rest goes well, we shall let the necessity of a plenum pass. The plenum and the vacuum, the finite and the infinite, are so many points on which philosophers never cease to clamour, but every article of which absorbs my reason, and very likely theirs too. However, I shall say nothing against what they either affirm or deny concerning this. Let us then at once pass on to the consequences of the fracture of their angulous matter.

We see in the neighbourhood of the places where marble is hewn, a number of children getting their livelihood in making the preparatives of the Cartesian system. They throw into a barrel a multitude of small pieces of marble cubical, triangular, and of all forms. This is an homogeneous matter, such as we would wish for. They afterwards with a string make the barrel roll backwards and forwards for whole days together. They cause these particles to revolve on themselves and every way. Now, let us in all haste open this barrel. A small world to be sure ought to come out of it; but we see nothing but balls and globules, which our little Cartesians will sell to some other children for play-things. 'Tis true, pieces more or less globular are formed out of these particles of marble rubbed long one against another; and there is about these globules a dust very irregular: but notwithstanding all these elements, the system goes

no farther. No collections of this dust are formed ; nay, if you continue to roll the barrel for whole weeks together, you pulverize instead of collecting. Nothing therefore can come out of the primitive matter of philosophers put in motion, or, if you will, broken at the angles, notwithstanding its hardness, more than what comes out of the barrel of these children ; nothing besides particles — which are more and more pulverized ; nothing, in short, more real than a childish amusement.

Would you have another matter, each particle of which revolves on itself, and all the particles whereof are forced to move in a circular line, by the resistance of an ambient body, that hinders them from leaving the centre ? In short, would you have a matter in which all has the motion of a vortex, as in the birth of the Cartesian world ? This may be procured you. See what passes in the pot of a glass-house. After a month, nay, after six months of the most violent motion, what will at last come out of it ? Why truly glass, and never any thing else.

4. But I shall suffer you to hook your three elements to each other after your own fancy. You may suppose them to have in nature the same degree of tractability you think they have upon paper. I no longer dispute this with you. The magnificent globe of the sun, the source of so much beauty, is now made up of the minutest sweepings proceeding from the broken corners of the elementary pieces. I grant that your dusty sun, composed of very fine scrapings, is a work whose beauty and perfection are perceived with the *utmost evidence*. The massier sweepings will afterwards afford you the comets and planets. They all of them already revolve regularly in their orbs. This again is *self-evident*. Every thing goes according to your desires ;

fires; and instead of expressing any surprize at *The WORLD* the confidence with which you ennoble your dust, *of DESCAR-* and pronounce upon things so very remote, I shall *TES.* act as if their remoteness took from me all right of disputing any thing concerning this; but day-light strikes my eyes as well as it does yours, and I tread upon the same earth with you. I may then try experiments upon the light which reaches me, and make observations both upon our earth in general, and upon every one of the particulars it contains. Now, all that we perceive in the light, and in the structure of the earth, is altogether inconsistent with the Cartesian fabrick.

1. The light, according to Descartes, is a mass of small globules immediately touching each other; so that a row of these spherical bodies is no sooner pushed at one end, but the impulse is felt at the other; as happens in a stick, or in a row of bullets touching one another. Mr. Reaumur and Sir Isaac Newton have observed, that when the earth was between the sun and Jupiter, the eclipses of his satellites happened sooner than was marked in the tables: but that when the earth was moving towards the opposite side, and the sun was between Jupiter and the earth, the eclipses of the satellites happened several minutes later, because the light had the large orbit of the earth to traverse in this last situation more than in the foregoing: from which discovery they came to be able to affirm, that the light of the sun was seven or eight minutes in traversing the thirty-three millions of leagues that are between the sun and the earth. However, let the exact duration of this passage of the light be what it will, it is certain, that the communication of it is not effected in an instant; but that the undulation or pressure of the light arrives sooner on the bodies that are nearest, and later on those

that are most remote: whereas a row of twelve globes, and one of a hundred, if they touch one another, communicate their motion with equal velocity. The light of Descartes consequently is not the light of the world.

2. The globules that compose the Cartesian light are all equally hard, and of a matter perfectly homogeneous. Globules so perfectly alike, ought to make impressions perfectly alike under the same impulsion of the sun. Now, a ray of light makes impressions quite different under the same impulsion of the sun, and contains in itself parts essentially different in colour, strength, and direction, as Sir Isaac has shewn by the separation of the several parts of a ray in the prism.

3. To avoid all disputes, we have granted to Mr. Descartes the possibility of the formation of an earth, by the re-union of several shards of primitive matter, or by the gathering of the thickest dust all over the outside of a vortex. There would be many things to be said on the motion of this dust, and on the sinking of these shards, more fit to be pulverized, and to assume a globular figure like that of minute balls perfectly smooth, than to form hooks, spirals, or ramifications. Let us not however oppose the work of Descartes's imagination. Let him convert these pretended ramifications, whose production is incomprehensible, into oil, filth, and scum. Let the whole thickened round a vortex have darkened a sun, and converted it into a real earth: sure this is a mighty agreeable novelty! Let us for a moment leave our abode, and pass over to this earth of a new creation. If it may be conveniently inhabited, I, in this case, see no reason of complaining of it.

First, prudence requires that we should pierce that crust to a reasonable depth, to know whether

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we may trust to it, and securely tread upon that scum. We shall not refuse to make it the abode of man, provided we find therein the same matters we have in the arch we live under. But I perceive an infinite difference in it. All these particles sunk one upon another, and thrown pell-mell, have got into a heap, and from the beginning remained in a state of repose or immobility, which hindered them from assuming any determinate form. It is not so with what we find in our earth, though all the parts of it be buried under one another; and motion can operate nothing in it, besides the carriage of some matters from one place to another by means of water and fire. Where there is no agitation of fire, nor any stream of water, I nevertheless find on all hands excellent matters, natures of an unalterable simplicity, and of wonderful use. Here I have gold, there I find iron. In another place I meet with sand, or with crystal; for the one is no way different from the other. I find there other natures less simple, but prepared with equal art. These are oils, salts, stones, flates, clays, marles, common earths, and load-stones. I give each of them a name; because we, from one end of our globe to the other, find still the same natures, the same differences, and the same services. In vain shall Mr. Descartes tell us, that all this is nothing but scum, but sediments of unformed pieces; or that, if they have any special and constant nature, it is motion that gave it them before they were heaped together, and laid in this state of repose. What motion formerly was able to do, it can do still. However, we don't see that motion can any way change gold, iron, or sand. Nitre and other salts are decomposed. We do the same with cinoper, antimony, and many other fossil matters: but we know what term we shall arrive

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arrive at. There are infallible terms every where. Natures are made, and indestructible. They are infallibly revived ; because they really are constantly the same in themselves, notwithstanding the dissolutions and mixtures that change them in appearance. They may be separated and re-united ; but we can neither change gold into another nature, nor reduce it to the simple and bare shards of the cubes of primitive matter. I find in our globe nothing but immense magazines of riches of all kinds, and of conveniencies, which a prudent and liberal hand has put within the reach of the inhabitants of this earth. But in the crust of the Cartesian earth we are now viewing, I find nothing but a coarse scum, and a heap of useless particles, as they are void of all design, without any distinction, and no care having been ever taken by any wise being to render them fit for any thing. Saying that God, without taking a particular care to render them good, foresaw that they would become such, is saying with Lucretius, that our eye was not made on purpose to see ; but that having taken notice that the eye was fitter to see than to smell with, we never offer it to odors, but to the light only.

The surface of the earth of Descartes perhaps will have beauty enough in it, to make us amends for the filth and indigence of the insides. Let us take a turn thither, and walk round that philosophical globe.

First, I am extremely surpris'd that any one should walk upon it. Mr. Descartes pretends, that his third element, his coarse dust, has here produced whatever is found on our earth. Let it be so. Again, let the particles of his elements have lost their motion, by gathering into several platoons. Let the particles of the other elements,
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by their centrifugal force, have obliged all these platoons to draw near the centre again: all this I still grant, though I do but little understand it. The WORLD of DESCARTES.

But the Cartesians, by arguing upon that foot, lay themselves under an obligation to find in their earth whatever we have in ours; metals, earth, and water. Some of these matters being incomparably massier than others, they must needs in sinking range themselves by strata according to their specifick density. Metals therefore will be nearest to the centre, and be to the earth what the stone is to a fruit: next to which we shall have a very large stratum of earth. The whole convex surface shall afterwards be covered with a large mass of waters. Let the cause of gravity be what it will, it exists; it produces the effect just mentioned: and in this manner it is, that the water was ranged on the first earth of Moses. But this primitive earth was uninhabitable. Therefore I here expect the solution of many difficulties from Mr. Descartes, who introduces me to his. Why is your earth exposed and uppermost? (I will first ask him) It ought to lie hidden and under the water. That circular motion which has ranged the whole without any interposition of God, could not foresee that this planet was to be the abode of an inhabitant. We have or may have, says Descartes, by means of our broken particles, all the general and particular things that are seen in the world. We ought then to find there an immense vase to lodge the water, a sea altogether like ours. If you have such a vase, your earth is not the work of a circular motion, as you pretend it to be. It is a design, not a circular motion, that has excavated that vase of an immense depth. It is a providence, not a sinking of large strata more or less heavy, that has prepared a retreat for the waters, and gauged the capacity

capacity of their habitation ; first, that this capacity of the vase might be proportioned to the quantity of the liquor ; secondly, that the stratum of the waters, which, according to the laws of gravity, ought to have been above the earthly convexity, might be placed lower, leave the earth dry, and the surface of it free to its inhabitants.

This vase puzzles you. But I have another question to ask. The general law of motion, which, according to you, has, by plain circular lines, produced so many wonders, has it also formed the fishes that swim in that vase ? Here a difference arises between the master and his disciples. Descartes, who promised to fetch out of his three elements the *things particular as well as the general*, will needs pretend to give us also the sea and the fishes. But his disciples abandon him, and unanimously reply to me, that, in point of organized species, we must change our principle, and have recourse to particular plans, and to special wills. I am glad to see you renounce this false notion of your master, and frankly own, that the design or command which gave birth to the enormous mass of the whale, and granted it only one young one every year, is not the same that has lodged the muscle between two small shells, and every year gives it a very numerous posterity.

You likewise almost unanimously confess, that it is a particular design that has joined the fruitful *farinæ* and the seeds upon the same stalk in most of the plants, on account of their immobility, and because they adhere to the ground : whereas another especial will has separated the two principles of fruitfulness in the animals able to pass from place to place, and to come near each other. You may again observe another plan in animals altogether solitary, and constantly sticking to the same place,

place, such as oysters, &c. The two principles of *The WORLD* fecundity may be thought to reside in every one of *of DESCAR-* them, since they all become mothers, and the wa- *TES.* ter fetched out of them in summer-time is always

full of small oysters, which the microscope renders perceptible. You see every where instances, not of a general motion, but of so many individual precautions. If then the thousand, nay, the hundred thousand living species that fill the vase of the sea with fishes, shell-fishes, reptiles and insects, have been fashioned after an hundred thousand different models and designs; if every one of these beings, and the posterity issuing from them, are the work of a special will, and not of a circular motion imprinted on matter; it may be said also, without any dishonour to God, that the vase which incloses them all, has itself no physical cause, and that he who made the fishes, made also the sea to lodge them in. Heretofore you looked with an eye of pity upon those who did not form the earth and the things it contains by a simple general law. Pray what do these general laws avail you? You are afraid of debasing the majesty of the Creator, in saying that our earth has been formed by a peculiar decree of his wisdom; and you are no longer afraid to say, that a hundred thousand wills or different plans are necessary to regulate the hundred thousand kinds of animals that people the sea. I never numbered them: nor is it very probable that you will cavil with me about that number, whose augmentation or diminution alters nothing in our present argument. But I have something more pressing still to propose to you.

Cast your eyes upon the first cray-fish that ever crept in the slime of rivers, or on the first lobster that ever appeared on the sea-shore. This cray-fish has no physical cause. God has constructed the

the vessels of it with an element of which he alone knows the nature and use. But he never commissioned any angels, much less any stupid beings, to form eyes, claws, horns, an ovarium, and the preparatives of a long posterity. God, in short, has in himself alone the plan of the first cray-fish; and his will is the immediate physical cause of it. But how was God to act, or how could he act, when that cray-fish was to be produced? I here consult you, as if you had been invited to give him advice, and to impart to him your schemes on the methods of operation which you should think most worthy of his infinite wisdom. Above all you would have been inclined to limit the number of the wills of God in this work. You would have been very saving this way, and would have thought it more grand to fetch the sun and the cray-fish out of certain particles of an unformed matter whirling on itself, than to construct the sun upon one peculiar plan, and the cray-fish upon another. You are very earnestly sensible, that general and uniform is nothing but a blind transport, that can neither foresee nor order any thing; and you at last are brought to say, that each living species is the work of a particular emanation of God's wisdom; but that the general laws must be preserved for the production of the heaven, the sun, and the earth. I here contradict you upon no account, nor do I oppose any thing that may seem to you of concern for the glory of the Almighty. But be previously very certain, that such or such a conduct must be his, before you attribute it to him. You go about this work with arguments. For my part, I still refer and for ever will refer you to experience. Pray, let us see this cray-fish arrive at perfection, before we speak of the progress by which

which motion, according to you, brings the whole world to its.

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TES.*

First, our cray-fish will not have its two eyes, unless God fixes the number of them. If it has an eye of such or such a shape, rather than a mole or a camelion's eye; this again is another command of the Creator. The place filled up by this eye has been appointed to it. It has no humor, nor any tunicle, but what God has measured the depth, circumference and effects of it. There is in that tunicle no fibre, in that fibre no filament, of which he has not determined the extent, bent the springs, and fastened the strings. No muscle shall be able to lift up or lower this eye, without having received its peculiar mechanism from the express will of the Creator. Another no less express intention has fixed the number of the paws the cray-fish and its posterity shall be provided with. Another will, every whit as singular, has placed at the root of its paws the preparations of other paws ready to push forth and grow, in order to replace the foregoing, whenever by any accident they shall be broken. Whereas the will of the Creator, who has given legs to the ox, and paws to the dog, has not thought fit to place any little ones in reserve, to make up the loss of the other in case they should be broken. In short, if there are a thousand vessels that distinguish the cray-fish from the crab, they have been conceived, measured, and placed in consequence of so many individual commands of the Creator, without which these different vessels had never obtained their being, place, and functions.

How! You multiply by thousands the wills of the Creator: you, in spite of yourself, are lavish of them when a cray-fish or a vile insect is to be constructed; and you are afraid of attributing to so many express commands the fabrick of the stars that

that sparkle in the heavens, or the structure of a score of simple elements, which, by their numberless mixtures, serve to maintain the species upon the earth, as the twenty or thirty articulations of the voice serve without end to form new words in the different languages?

You make the action of God to intervene in the formation of the very pads and the three hooks that terminate the paws of a spider; and you are afraid of attributing to God's special will the organization of two bodies so wonderful as are the earth and the sun. This method of arguing throws you, together with Descartes, into an unintelligible fabrick, or, with Leibnits and many others, into metaphysicks as fruitful in airy notions, as those of the Pythagoreans or the Brachmans.

In comparing, as you do, the possible effect of general laws, you undoubtedly intend to vindicate the conduct of the Creator. But what need has he of your justification? You imagined you did honour to God in assigning great simplicity to his ways, and great fruitfulness to the effects resulting from them. But the glory of God will be no gainer, and man will be every way a loser by general laws productive of the world.

The glory of God, which you think inseparable from your general laws, is no way connected with them; since you attribute to him a parsimony of intentions, which is not in the least the character of his ways in the production of beings. God, you say, has foreseen, that by imprinting a two-fold motion on matter, a thousand suns and ten thousand planets would be the result thereof: he foresaw, that he could not with four different motions have a much greater number of planets and suns, and has been contented with the combination which produced the greatest number of effects,
and

and required least apparatus, and the least number of different intentions. Pray, combine what is about you, and compare not things which you do not understand, nay, which have no sense in them.

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TES.*

How can you pretend to fetch out of your particles moved round their own centres, and in the way of vortices, thousands of suns and of planets, all of them furnished with their wonderful atmospheres, if you know not what a sun, a planet, or an atmosphere are? And how dare you to pronounce that a whirling motion, which you scarcely conceive, will be able to form a world, of which you have a still less conception, if, by your own confession, it cannot so much as give birth to a vile rat? Now, you all of you confess, that motion can organize nothing.

There is not only no kind of benefit to be reaped from these imaginary physicks, which pretend to lessen the trouble of providence in the formation of the universe, and to ease it of individual cares, as if these could debase it; but this philosophy is besides every way detrimental to man. He not only contracts a habit of losing himself among a crowd of chimæra's, which are not a whit less empty for being sublime, and of arguing against the evidence of facts, which constant experience every day lays before his eyes; but this matter primitively moved is with him a precious idol. It is in reality blind, destitute of understanding and design. Man nevertheless attributes every thing to it. It is matter moved that produces the elements. It is nature that has ordered the spheres, incrustated the planets, and by means of a remainder of dust less weighty than the rest, has encompassed the planet with an atmosphere. Constantly taken up with this nature of his, he in short hardly ever deigns to mention the first

mover. He does not favour atheism, because that is the highest pitch of extravagance: but the wisdom of God, his intentions, precautions, favours, and the continuance of his bounties, which are what we best apprehend and experience in his works, are absolutely banished out of the great physicks, and God is therein as intirely forgot, as if he existed not.

* Reason-
able use of
the gene-
ral laws.

I know you alledge in your own favour experience, to the tribunal of which I referred you. Experience, you say, testifies the existence of the general laws that regulate the course of the universe. If we follow God * in the government of the world, we shall no doubt see a majestick uniformity reigning throughout. Experience authorizes us not to multiply the wills of God so much as the clashings of particular bodies. With one single act of his will, he has in all cases, and in all succeeding ages, regulated the course and shocks of all bodies, in proportion to their mass, velocity, and spring. The laws of these clashings and communications doubtless may be the object of a very judicious and useful body of physicks, especially when man makes use of them to direct what has been submitted to his government, and to construct those different works of which he is the subordinate creator. But don't here mistake. Creating bodies, and assigning them their place and functions, is one thing; and preserving them is another. One single will, or certain general laws faithfully executed, are sufficient to maintain each species in its peculiar form, and to perpetuate the vicissitudes and œconomy of the whole. But when the business is to create, to regulate these peculiar forms, to render the preservation of them infallible and constantly the same, to settle their relations and universal correspondence; in this case, as many particular plans and special wills are neces-

necef-

necessary, as there are different pieces in the whole machine. *The WORLD of DESCAR-*

TES.

Now that the world is made and going ; if I was asked what the cause of the formation of such or such a stratum of stone is, why such or such shells are found in a certain kind of stones ? why a sort of marbling in some other kind ? why lime-stone calcines in the fire, while another is vitrified therein ? what the origine of rain is ? and what it is that supplies fountains with water ? or any other the like questions : having immediately recourse to the will of God, would not be answering like a naturalist, God having established natural causes to regulate the birth and preservation of these things. For instance, I would say, that stones are formed in those places where waters carry and collect the sand, clay, and lime which they are composed of : that the lime-stone is that in which earth is predominant : that the stone which may be vitrified is that wherein sand is in greater quantity : that when the crystalline or stony matter is by the water conveyed upon strata of shells, here and there deposited by the sea after its ancient change of place at the time of the flood, this produces stones with a mixture of shells, such as those found in the quarries about Paris : that when the crystalline juice is mixt with and flows round a heap of flints of different colours, or upon strata of clay, the whole produces masses of marble or of jasper variegated with different veins. I would likewise say, that the perpetual evaporation of the water, salt, and bitumen of the sea, maintains the dews, rains, favours, and odors ; and that the rains that fill the subterranean reservoirs, supply the wells and the perpetual or the intermittent fountains : that consequently in the torrid zone, where immense rains fall, the moun-

tains collect a sufficient quantity of water to supply prodigious rivers, such as the Amazon's and la Plata ; while on the other hand, in places where it never rains, the longest ridges of mountains, such as those which attend the Nile on either side in a space of nearly two hundred leagues in length, never yield the smallest stream of water, nor the least fountain. I would thus, to the best of my power, assign to each peculiar effect its immediate cause. Such is the employment of particular physicks, whose aim next to this must be to make the whole subservient to the necessities of life, and the glory of the Creator. But if you throw me into generalities, if you refer me to the origine of sand, water, iron, &c. I have nothing like any general laws to produce them. These natures have no physical cause ; at least I am no way intitled to assign any such cause to them.

If I see twenty or more elements successively entering into the composition of those bodies that grow and are dissolved : if I find, after a thousand and a thousand mixtures, these elements inviolably the same ; does not reason teach me thence to conclude, that God has prepared them to vary the scene of the world ; but that he has at the same time rendered them invariable in themselves, thereby to set bounds to these changes ; that after a long series of unfoldings, increases, dissolutions, and vicissitudes, the world might still be found the same it was four, five, or six thousand years before ? There is in all this nothing dishonourable to the Creator, nothing that is not perfectly agreeable to experience. It is then going against experience, against the glory of the Creator, and contrary to the interests of true piety, to refer the creation to a general motion, instead of ascribing the formation

tion of the whole and of every part to the intentions and the special wills of the Creator.

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I shall here add for the good of mankind, which ought to go before any other consideration, that the atoms of Gassendus, and the homogeneous matter of Descartes, have now more than ever procured credit to the extravagance of transmutations. Alchymists are hooted at by all naturalists as crack-brained men. But have those who hiss them any just reason so to do? Alchymists do but seek after what is a plain consequence of the doctrine of the atoms and of homogeneous matter. For if metals, mercury, common salt, sand, lime or ashes, water, air, fire, light, and some other matters, are so many unalterable natures, as immutable as the will of that Being who made them the basis and support of his world: in this case indeed the corpusculists and the alchymists know neither what they say, nor what they are looking for. But if these natures, which I take to be simple, elementary, and, with regard to us, indestructible, are, as Gassendus and Descartes thought them, nothing but compounds of atoms, or of a few parcels of homogeneous matter, of which it is possible to make whatever we please; I hope that philosophers will at last take the resolution to come to the point: that, for the greater good of mankind, they, instead of losing time in discoursing, will all of them turn alchymists, break the corners of angles, transmute half-metals into perfect ones, or at least dissolve mixt bodies, and by force of fire dissolve all the bonds of our elements; insomuch that the operation may reach the very atoms, and the homogeneous matter be obtained. Which done, they will have reason to entertain hopes of finding a certain happy turn, that may convert a lump of primitive matter into an ingot of gold.

COSMO-
GONY.

Atheism
supported
by Cartesi-
anism.

Let us, though against the grain, make one confession at last. This method of employing motion alone to organize matter, is what has given atheists greater confidence, in making them mistake for profound physicks a few appearances of reasoning attended with geometry. But all this profundity is nothing but darkness and misery. A friend of mine, whom a just correspondence and the best intentions sometimes lay under the necessity of hearing the doctors of that school, now very numerous, gave me the history of their principles.

There is, they say, an universal matter, indifferent to become every thing, or susceptible of all sorts of forms. This point is granted to us by all the schools. Let us for a moment be allowed to suppose this matter eternal, and to add to it a motion for ever distributed through all and every one of the parts of that matter. This is sufficient to us to account for every thing : and why should we be willing to admit any thing more, if that can suffice? First, it is as easy for us to admit of a matter eternally moved, as it is to admit of an eternal God. Matter is good, and motion is a perfection. Is it more difficult to establish that this twofold excellence is eternal, than to prove, that there is a Being, who, from all eternity, is possessed of every perfection? This being supposed, it is more reasonable to attribute the organization of the world and of what it contains to an eternal motion, than to an eternal mover different from matter itself. For the world, were it the work of God, would bring upon its author as many reproaches as there should be perfections (a) in it. But there are no longer any complaints to be made, if the world is the result of a bare mo-

(a) This is the substance of all the arguments of Bayle and of Spinoza, the most zealous partizans of Descartes.

tion :

tion: and to espouse this convenient system, which attributes the organization of the world to an eternal motion rather than to an eternal wisdom, it is enough that this organization may possibly be the plain effect of motion. Now, the thing is evidently possible. The great Descartes, the most meditative, the most systematick genius, and the most accustomed never to admit of any thing but what may be evidently conceived, has taken for the basis and fundamental principle of all his physicks, that *matter in motion must produce all the things both general and particular which are seen in the world, without any order or proportion's * being put among them by God.* These are his very words. ** Treatise upon light.*

Let us, they say again, to the evidence of this possibility add another proof, which is matter of fact. It is easy to see that our globe revolves from all eternity; since the sea, which has not much altered its place for these four thousand years, has nevertheless successively passed and repassed over all the lands, and every where left marks of its passage in large depositions of shells and marine bodies. Whereby it is plain, that these changes of place, which are operated so very slowly, cannot possibly have successively covered and left all the lands, except in an innumerable series of ages, and very likely through an eternal duration.

All I see clear and certain in this way of reasoning in deists, is, the shame and dishonour it brings upon that vain-glorious philosophy, which requires nothing but matter and motion to construct the world. Materialism is the result of it. But those who think they, by the Cartesian doctrine, authorize atheism and all its deplorable consequences, have had recourse to either dreams or fictions, in order to support impiety. The demand they make of a matter that has put itself in

motion from all eternity, is a demand void of all sense: and though the possibility of a matter eternally moved were of the utmost evidence; they will never fetch out of it any thing but a chaos, not an organized world. But instead of opposing here syllogism to syllogism, and subtilties to subtilties, it is both more proper and more secure, from plain experience at once to demolish all their pretensions. They first fancy they conceive that there may have been from all eternity a matter constantly moved: but it is a notion contradicted by experience. There is none but sees that motion is accidental to bodies. Bodies may be at rest: it is their natural state; and when they are in it, they will for ever remain so, unless they are pushed. People know not what they say when they attribute to them tendencies towards moving, appetites and efforts. If then matter is in motion, it must needs have received that motion, and there is a mover.

In the second place, some fancy they can employ the homogeneous and universal matter of Descartes, because by wearing out at angles, and by whirling, it becomes whatever you please. But a matter of this kind, as we say, is a mere chimæra, not any thing real. And as there is not now any matter universal or common to all bodies, there has been no such thing from all eternity. Each element is a bottom or ground by itself. One has nothing of the other: nor can the one become the other. They are so many precious materials, whose invariable excellence and determinate number intimate to me a design, intentions, and just measures.

Well, will the materialists reply, we give up the vague matter of the schools. For the future we shall ever be contented with incommutable and inde-

indestructible elements. But if they are immutable and inexterminable, they are then eternal. Let us suppose a motion in them. This will sufficiently intitle us therefrom to deduce all the effects that are produced in the world : and if that is sufficient, we shall not go back to any ulterior and superior being. For any man using his reason avoids multiplying beings without necessity.

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What signifies all this dialectick ? It is not true that the eternity of elements may be deduced from their actual incorruptibility : and if they were even as eternal as they are incorruptible, motion could make of them nothing but rough masses without any order. If then there is a world well ordered, it is neither the elements nor any motion whatever that have produced this work.

First, it is not true, that by having demonstrated that elements are now ingenerable with regard to us, and indestructible by all our efforts, we give any room to believe them eternal. But we can never deal fairly in so important an inquiry, so long as we have recourse to subtle wranglings. Let us build on certainty. If experience can bring us acquainted with the origine of these elements, common sense suggests, that we must stick to the certainty of that experience, and not run away with frivolous arguments.

I can and ought experimentally to judge of the materials of the world, or of the fabrick of the elements, as I judge of the organization of the whole : and as I see so evident a prudence in the sortment of the whole, I cannot but find the same in the preparations of the pieces. This is quite plain. And really experience has taught me, that there is not less prudence used in the making of the wheels of a watch, than in their re-union ; and that there is not less design in the determined form of the letters

letters that fill the boxes in a printing-house, than in the collection of these letters in order to print a work. This sure is common sense. Metaphysicks that swerve from it, and pretend to lead us to other consequences, by denying that there is any counsel or prudence in the relation we observe between the light and the ball of the eye, are pitiful, and deserve no reply.

If the materialist talks nonsensically, when, instead of an infinitely powerful intelligence, he establishes either principles determinate from and to all eternity, and putting themselves in motion, (which is full of contradiction) or a vague and eternal matter apt to become whatever you may imagine (which is constantly belyed by experience); he says nothing more rational, and even carries his rashness further, in affirming after Descartes the possibility of the organization of these matters in consequence of a general motion, without the further intervention of God. But though this possibility of a matter moved spontaneously from all eternity, should be as conceivable as it is absurd and contrary to reason; that matter would nevertheless be still a dull lifeless ground incapable of producing either a world, or order, or spirits, or intelligent substances. Cartesianism is then here no manner of assistance to materialism; because the Cartesian fabrick of a matter moved and whirling, which afterwards disposes itself into a regular world, in which God puts no manner of proportion, is every whit as unintelligible, as a blind matter that ingenders light, order, wise measures, and intelligent substances. Reason understands nothing in either point: and experience clashes equally with both. Of this we saw the proofs: and it is a notorious fact, that sand moved whatever way and as long as ever you please, will
always

always be sand, and shall never be a bird, or a pendulum, no more than an angel or our own spirit.

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of DESCAR-
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The third article ; I mean the perpetual tendency of the sea to leave one whole side of the world, in order to gain gradually upon the other, and successively to pass over every part, which is alledged as a palpable instance of an eternal duration, is another idea equally contradicted by experience.

The sinkings and risings of sands and of unsettled grounds, may repel or attract the waters of a sea, and occasion a few local variations. Thus it is that the sea is at all times ready to overflow certain parts of Holland, which are preserved only by the force of dikes. Thus it has abandoned Harfleur in Normandy, and the port of Aigues-mortes in Languedoc. But though it has quitted some of our western coasts by the distance of a league, it has nevertheless not covered the eastern coast for the same distance. The ports of Japha, Alexandria, and Smyrna, are what they were formerly. The sea has remained constantly in the same place for the four thousand years it has been known : nor can it be proved that it has universally left uncovered the northern or western lands, I will not say by the distance of a league, but of one single fathom, in order to ascend as much on the opposite grounds.

The numberless shells and marine bodies which are frequently found in the lands now inhabited, are, together with the horrid fractures and declivities observed in them (*a*), the proofs, not indeed of a gradual displacing of the waters successively diffused over the whole surface of the earth through

(*a*) See the letter at the end of the third Vol. of the *Spectacle de la nature*.

an eternal series of ages, but of an universal hurricane suddenly raised all over the outside of the globe, of a splitting of its surface, of a sudden sinking of the friable parts, and of a transportation that was made of the whole mass of the waters from within their ancient reservoir over the major part of the lands which men formerly inhabited ; so that a great part of our habitations happen to have been portions of the ancient bosom of the sea, and this now covers a very great number of the habitations of the first men.

Had the sea by little and little got over all the lands ; had it covered and proportionably uncovered all the plains and all the mountains ; to be sure we should, with the spoils of that element, every where find the innumerable vestiges of the habitations of men : a multitude of vases and hard matters, of worked metals, of buildings, and even whole towns. We should every where see monuments varied according to the countries, and shewing as many different characters as there should have been revolutions in the immense duration of eternity. Now, there is no such thing found. The major part of the terrestrial fruits and animals, which men thought they had found among the spoils of the sea, being closely examined, prove now quite other things. The pretended serpents tongues found in the collections of natural history, are evidently the teeth of the great sea-dog. The pretended fruits, which they mistook for petrified olives, are the ornaments with which a certain kind of sea-urchin has its shell-scuttle covered all over, and which play upon its back like so many arms or levers. The large bones that have been often met with under ground, and mistaken for elephants bones, prove now to be the carcases of hippopotami. In short, we every where find marks
of

of the dwelling of the sea, but none of those over-
 flown habitations which ought to be met with on
 all parts.

*The WORLD
 of NEW-
 TON.*

But this is dwelling too long upon these dismal
 notions: let us rather lament the turn of mind of
 these men who preach nothing but evidence, and
 who content themselves with a materialism not
 only incomprehensible, but also full of absurdity:
 who abandon experience and history, which they
 have in their hands, to run after possibilities con-
 tradicted by matter of fact; and who, in order
 to decide what we are to think about the flood and
 the foundations of the whole revelation, chuse to
 have recourse to metaphysical subtilty, rather than
 to the consonancy of traditions, monuments, expe-
 rience, and common sense.

IX.

The world of Newton.

I T is not with the principles of Sir Isaac New-
 ton as with the primitive matter of Aristotle, Gas-
 sendus, and Descartes. This matter, let it be
 represented to us under any terms whatever, as
 producing all things, both general and particular,
 by the bare impression of motion, is agreeable nei-
 ther to the recital of Moses, according to which
 each particular being is the work of a particular
 will, nor to experience, according to which it is
 impossible for any general motion to organize a
 body, or to produce an elementary grain. Whereas
 Newton's physicks seem perfectly agreeable to
 both. He contradicts experience upon no account,
 if the whole of his physicks amounts only to the
 establishing a general action, which experience may
 shew us to be in nature, without attempting to
 assign

assign the cause of it. His physicks agree perfectly with the recital of Moses ; since Newton, like Moses, attributes the production of the several elements, and the organization of the whole, to so many commands or intentions of the Creator.

I had till now deferred finishing the reading of the last part of his opticks, because it contains a number of questions, which appeared not to me to have any connexion with my present work. I have just resumed this part, towards the end of which I find two observations, which I quote with the utmost satisfaction. I have endeavoured through the whole course of this history to establish it as a truth, that we are to attribute to so many special wills of God, not to any created cause, the origine of the several elementary natures, and the formation either of the organized species, or of each sphere, and of the whole world. I thought I had found the proof of this truth in nature, such as it is established by the recital of Moses. Nor is it a small satisfaction to me to find this opinion, which has made impressions upon me many years before I read Newton, so clearly established by a philosopher of so much weight.

“ In the beginning, says he, God formed mat-
 “ ter into particles solid, massy, hard, impene-
 “ trable, of such magnitudes and figures, with
 “ such other properties, in such number and quan-
 “ tity, and in such proportion with regard to
 “ space, as best answered the end for which he
 “ formed them. And as these primitive particles
 “ are solid, they on that very account are incom-
 “ parably harder than any of the porous bodies
 “ which are composed of them ; and so very hard
 “ are they, that they neither wear out nor can be
 “ broken : nothing being capable, according to
 “ the common course of nature, to divide into
 “ several

“ feveral parts what has been originally made one The WORLD
 “ by the difpofal of God himfelf. While thefe of NEW-
 “ particles continue intire, they may through all TON.
 “ ages conftitute bodies of one and the fame na-
 “ ture and texture: whereas if they fhould happen
 “ to wear out, or to be broken in pieces, the na-
 “ ture of things, which depends on thefe particles
 “ fuch as they were made in the beginning, would
 “ change infallibly. The water and the earth,
 “ compofed of old particles worn out, and of
 “ fragments of thefe particles, would not at pre-
 “ fent be of the fame nature and contexture as the
 “ water and the earth that fhould from the be-
 “ ginning have been compofed of intire particles.
 “ Confequently, that nature may be durable, the
 “ alteration of corporeal beings ought only to con-
 “ fift in the different feparations, new afsemblages
 “ and motions of thefe permanent particles: com-
 “ pound bodies being liable to be broken, not
 “ through the middle of thefe folid particles, but
 “ in places where thefe particles are joined toge-
 “ ther, and touch one another only in a fmall
 “ number of points.”

This gives Mr. Newton occafion to add after-
 wards, “ that it feems that all material things
 “ have been compofed of the above defcribed
 “ hard and folid particles, diverfly combined in
 “ the primitive formation of things by the direc-
 “ tion of an intelligent agent: for to him who
 “ created thefe particles it belonged to put them
 “ in order. It would not be acting like a philo-
 “ fopher to pretend, that the fimple laws of na-
 “ ture may have been capable of fetching the world
 “ out of the chaos, though this world once made
 “ may, by help of thefe laws, continue to fubfift
 “ for many ages together.”

Let

Let us now see what the philosophy of Sir Isaac Newton teaches us, and what benefit we may reap from it.

It may be reduced to three principal heads, viz. vacuum, the laws of motion, and attraction.

First, that there may be, and that there are in reality, spaces empty of all bodies in the universe, Sir Isaac and all his followers undertake to shew, both from the supreme power of the Creator, and from the immobility or universal stiffness, which, for want of the intermission of vacuum, would be in the mass of bodies.

God, for instance, may create no more than six unequal globes, and put them three large and three small ones together. The three great ones drawn near each other, leave an empty space between them, and the three small ones do the same. The vacuum which is between the largest is greater than that between the smallest. There may of course be a vacuum, more or less considerable, according to the remoteness or proximity of bodies.

The possibility of a vacuum may be proved still more simply. God is supposed to have thought it fit to create none but one single hollow ball, or now to create a hollow globe, whose arch is intirely without pores, and admits no strange bodies. Does not vacuum in this case become possible and necessary?

Next to this, the Newtonians, as well as the Gassendists, try to establish the necessity of a vacuum, without which they pretend, that motion would be impossible in nature; because any body moved would every moment be obliged to displace a mass of matter always equal to its own, and would of course meet with a density or a resistance as real in a fluid mass as in a mass of stone. The stone resists the body moved, only because the

the latter loses a quantity of motion equal to that it communicates to the former in displacing it. Now the fluid mass being really equal, takes from it as much motion as a stone to be displaced would do. The resistance therefore will be the same, and the bodies moved will be incessantly stopt in the plenum: or in other words, admitting a perfect plenum in the universe, is introducing an universal stiffness or petrification into it. There is no end of these disputes. For my part, I frankly own, that I never could understand any thing in the Cartesian plenum, and that, besides the inextricable difficulty of making bodies move freely, and every way in a plenum constantly equal, reason is still more shocked at hearing people coldly say, that God could never create a hollow globe, without introducing some matter into it.

Mr. Descartes is the first who has studied the constant laws of motion, and pursued this part of physicks, which may be of so much instruction, both in point of astronomy and of mechanicks. But though his first endeavours are infinitely valuable, yet is it generally confessed, that he mistook in a great many points. Newton, without dispute, enjoys the glory of having carried the exactness of observation and calculations concerning the shocks of bodies, and the communication of motions much farther. Possibly he has not cleared all; and there may be some mistakes to be redressed in certain articles still disputed. But his work in this kind is of infinite help to us.

The first law which Sir Isaac Newton establishes after Mr. Descartes is, that every body has a tendency towards remaining in its state either of rest or motion. Any body at rest by its mass resists the impression of motion, and the larger the mass, the greater is the resistance. (But must it be

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I. Law.
The tendency of
bodies towards per-
severing in
their state.

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surpassed by a greater force to be put in motion?) A body in motion continues to move, till another force stops it, or makes it deviate from its direction: and this disposition of bodies towards persevering in their present state is what Sir Isaac calls *vis inertiae*. It is a passive state, whereby a body either continues at rest, or perseveres in the direction of its motion; because a body cannot move spontaneously, or give itself a new direction.

This law, though agreeable to experience, might, if not well understood, occasion dangerous mistakes. The *vis inertiae* is nothing real in the body at rest: and the resistance to the impression of motion is greater or less in bodies at rest, in proportion to their density, or to the greater quantity of matter through which the motion is divided. The greater the division, the greater the resistance. Therefore a large mass resists more than a small one. The *vis inertiae*, or the tendency towards persevering in the same state, is also found in moving bodies; but in good truth this tendency is as yet nothing real in them: It is foreign to them. However, it is something very real in God in whom it does reside; since it is nothing but that constant and regular action, whereby the Creator continues to transport bodies according to the law he has established. 'Tis true, this is not what Sir Isaac says: but it evidently results from his principles. There are, according to him, and experience, cases in which bodies, in clashing against each other, lose all their motion; other cases, in which one body loses all its motion, by communicating the whole of it to another, and cases in which motion is divided. Newton observes, and admirably well accounts for the variety of these divisions, according to the variety of cases. One truth sensibly results from it, *viz.* that God has regulated these things

things according to his will, and that their persevering in their state, is nothing but an effect of his law. There is in the body moved no virtue, or any real force inherent in it, nor any discernment to vary its direction ; but a bare effect of that omnipotence, which continues to move bodies according to the different cases, and in the manner appointed by his wisdom.

It is so very true, that this perseverance of moved bodies in continuing their motion is no reality in them, and is no way different from God's will, that this motion has bounds, and ceases totally in the cases prescribed by the free will of the Creator. When two hard bodies of equal bulk and velocity meet, God, instead of taking all motion from them, (as he does in this case) might have commanded the one to transfer its motion to the other, in which case they would have been reflected, continuing each the way begun by the other. He would not have it so, doubtless, that certain motions might finish instead of continuing for ever : which, together with the motions newly occasioned by the liberty of man, would have put the earth into confusion, by a multiplicity of actions contradicting each other, and perpetuated in infinitum.

It was proper to make this observation upon the tendency of moved bodies towards persevering in their motion and direction ; lest those who may approve of the Newtonian system should suppose in bodies moved a force and reality of action which is not in them ; and that they may on the contrary be sensible, that the perseverance of bodies in their motion is the work of the most free will of God, and of a providence that watches over us : that it does not necessarily follow from the sun's revolving to-day towards the west, that it will reappear to-morrow at the east ; and that the laws whereby the

world is governed, far from diminishing in the least our gratitude, ought rather, when rightly understood, to excite and enliven it.

II. Law.

Proportion of the effect to the cause.

The second Newtonian law is, that the extent of the cause rules that of the effect, and that the alteration of the effect is proportional to the alteration of the cause, which being simple, double, or triple, produces a simple, double or triple effect : which point requires no explication, nor any remark.

III. Law.

Reaction.

The third law consists in saying, that where-ever there is any action or impression, there is likewise a reaction contrary to it, and equal to the impression. Which means, that if one body acts upon another, the second takes from the first a part of its motion : whereby Sir Isaac understands that the second acts upon the first by the whole extent of the activity it takes from it. For instance, if a body meets with another, it is either totally stopt, or only retarded according to the case. But it always loses what it communicates to the other, and it is always stopt or retarded by a power exactly equal to what it loses, and consequently a power which the other exerts upon it. A globe pushed clashes with another that went less quick than it, and accelerates the velocity thereof. What velocity the second acquires, it takes from the first. What it acquires therefore acts upon the first, since it pushes it in a contrary direction ; or, in other words, retards it as much as it is itself accelerated. If a horse, having strength equal to one thousand pounds weight, puts in motion a pack weighing eight hundred ; so much as the horse pulls the burden, so much does the latter draw the horse. They equally exert on each other an impression of eight hundred pounds weight. The horse which has something more, and which by the flexibility of his muscles always repeats the same action,

action, and the same power, goes on, is superior, and causes the burden to follow. If you put upon the horse a child weighing forty or fifty pounds, the horse will still go on. But if he is mounted by a fellow of two hundred pounds weight, then the whole strength of the horse is exhausted. The horse who tries to carry off both man and pack, exerts upon the whole burden a power equal to a thousand pounds weight, and the burden on the other hand exerts the force of one thousand pounds weight upon the horse. They remain in equilibrio, and nothing proceeds.

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The fourth law, and that which most especially characterises Sir Isaac Newton's system is, that all bodies weigh one upon another, or that there is in all bodies a force which may be called attraction, whereby they tend, or are carried towards each other.

IV. Law.
Attrac-
tion.

Of this, says he, we find the proof both in the heavens and on the earth. In the heavens we see the stars approaching each other, sometimes more, sometimes less, and an inquiry may be made into the cause which hinders them from receding incessantly from the centre of their motion, or which brings them thither again. In making the first trials of this inquiry upon the moon which turns round the earth, we find that the same cause which brings down a flint or a marble cast into the air, also brings down the moon again towards the earth. The stone cast has a centrifugal force, whereby it recedes from the earth. But it at the same time yields to another superior force tending towards the centre, which brings it to it again. The moon likewise, by the motion it has received, and which carries it off from the earth, has a tendency towards receding from it : and it would really go for ever from us according to the first law, if there was not

at the same time another power that brought it back towards the earth. One of these two forces is a bridle to the other. Were the moon abandoned to its centrifugal force, it would leave the circular line it describes round the earth, and proceed according to a strait line that would be tangent to the point, wherein it should leave the circle of its revolution: and if it was totally given over to the centripetal force, it would rush precipitately upon the earth. But the concurrence of these two forces detains it in its orbit. Whereby it appears, that the strait line, wherein the moon endeavours to get away by the centrifugal force, is bent or curved by the force of retraction, and that the next tangent which it endeavours anew to describe, is also instantaneously curved by the centripetal force. This curvature is properly the work of attraction; and we know by geometry, that the moon falling towards the centre by the uniform virtue of the same attraction, would describe the ray of its orbit in the same space of time that it would describe the quarter part of the said orbit or curvature. In measuring the time it employs in describing one quarter of its orbit therefore, we also measure the time it would be in describing its ray by the uniform impression of attraction. We know the duration of the circular revolution of the moon round the earth. We likewise know the distance from the earth to the moon, *viz.* sixty terrestrial semidiameters. Knowing then how many feet of its orbit the moon describes in one minute, we know how many of its rays it would describe in falling uniformly towards the centre by virtue of the attraction it feels at that distance from the earth: and it is found that it would describe fifteen foot in one minute. But it has been observed on the other hand, that the attraction, which brings the moon
down

down again towards the earth, acts differently, according to the different points of remoteness from the centre ; that it increases towards the earth in an inverse proportion of the square of the distance, or that it diminishes from the earth in proportion as the square of the distance increases : so that the moon placed at the second terrestrial semi-diameter, would be attracted four times less than at the first : when placed at the third semi-diameter, it would be attracted nine times less vigorously : and the attraction would be sixteen times less at the fourth semi-diameter, and so on. The moon, which at the sixtieth semi-diameter describes fifteen foot in one minute, being at last sixty times lower, or very near the earth, would then in one minute describe 3600 times fifteen foot : the square of sixty being 60 times 60, that is, 3600.

Let us now see what space a stone falling down goes through in one minute. It is placed exactly sixty terrestrial semi-diameters lower than the middle distance of the moon. It is matter of fact, that in one second, or the sixtieth part of one minute, this stone goes through a space of fifteen foot. Now, according to the experiments made by Galileo, the spaces gone through by heavy bodies are as the squares of the times. What will the square of the sixtieth second, which completes the minute, be ? It is sixty times sixty, or 3600. The stone shall then at the end of the minute have gone through 3600 times fifteen foot. Multiplying fifteen by 3600, the product will be 54000.

Thus the moon and the stone, when in the neighbourhood of the earth, will equally go through fifty-four thousand foot in one minute : and the stone, if carried into the orbit of the moon, and thence let go, will there experience an attraction 3600 times

less, or will go through only a space of fifteen foot in one minute.

Sir Isaac from this conformity of effects having deduced the unity of the cause, and endeavoured to shew that gravity is nothing different from attraction, looks upon the earth for other proofs of the attraction, by which bodies, according to him, tend toward each other. In order to this, he alledges the rising of fluids in capillary pipes, magnetisms, and electricities, insisting above all upon an experiment, which seems to prove attraction sensibly enough.

He exposes the fact in his opticks as follows :

“ If two laminæ of glass, flat and smooth, three
 “ or four inches broad, and twenty or twenty-five
 “ inches long, are laid one parallel to the hori-
 “ zon, and the other upon this, in such manner,
 “ that touching one another by one of their extre-
 “ mities, they make an angle of about ten or fifteen
 “ minutes: their inward surfaces being moistened
 “ with a clean cloth dipt in the oil of turpentine,
 “ and one or two drops of this oil being let fall on
 “ that end of the under glass which is most remote
 “ from the abovesaid angle, so soon as the upper
 “ lamina shall be laid upon the inferior in such
 “ manner, that it may touch it at one end, and
 “ make with it an angle of ten or fifteen minutes
 “ just mentioned; the drop will begin to move
 “ towards the meeting of the two laminæ of glass,
 “ and continue so to do with an accelerated velo-
 “ city, till it gets thither. For the two glasses
 “ attract the drop, and hurry it toward the part
 “ where the attractions incline: and if, while the
 “ drop is in motion, you raise this extremity of
 “ the glasses at which they touch each other, and
 “ towards which the drop proceeds, the drop will
 “ continue to ascend between the two glasses, and

“ con-

“ consequently it is attracted; and the higher you
 “ lift this extremity of the glasses, the slower
 “ the drop will mount. Being at last stopt, it
 “ will be as much hurried downwards by its own
 “ weight, as it was carried up by attraction.”

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The fifth part of Sir Isaac Newton's philosophy consists in examining what must be the curve described by a planet, which being carried away by its centrifugal force upon a tangent, is perpetually retracted towards the centre, and thus obliged to circulate. He, by the most exact and most profound geometry, finds, that this curve must be an ellipsis, or an orbit nearly of the oval kind: which is agreeable to the phænomena.

Sixthly, he applies his principle of attraction to the sun and planets. He pretends that the sun weighs or tends towards them, and that they reciprocally gravitate upon him. He examines the mass and weight of each of these bodies: and comparing the motion of the sun towards them and the gravitations or respective tendencies of the planets towards the sun; of the primitive planets towards each other, and of the secondary planets towards the great planet that serves them as a centre; he thence deduces situations and a course, which prove more agreeable to the phænomena than any thing hitherto said on this subject. And on this comparison of the attractive forces of the planets it is, that the most famous part of Sir Isaac Newton's physicks runs.

X.

Judgments on Newton's physicks.

MOST of the northern naturalists, and many of our own, being out of conceit with Cartesianism, which

which both in general, and in its application to particular cases appeared little satisfactory to them, were but the more ready to listen to a new master. They were transported with the admiration of the exactness of Sir Isaac's geometrical operations; and by degrees came to overlook certain difficulties, which the obscure idea of attraction at first raised in their minds, in consideration of the conformity of the whole to the celestial phænomena. This doctrine is now very well received in the most famous academies. It, in a manner, holds the first rank there: and the partisans of Sir Isaac Newton, when they come to understand his geometry, are so much affected by the penetration of his genius, that they never mention him without a kind of enthusiasm: "His demonstrations are ideas altogether divine. He has gone further than we ever could have expected to arrive. Angelick natures are jealous of what has been granted to him; and it is a very great honour to mankind, that Newton has been one of the species."

Some other naturalists, not only Italian, German, and French, but also of his own countrymen, pass quite another judgment on his philosophy. If satyr and a partial disposition have no share in their complaints, it is but just we should hear them.

We are, they say, neither envious nor ungrateful. We are indebted to Sir Isaac Newton for knowing light and colours more exactly than we did before. It is he that has with success helped on the construction of the reflecting telescope, of which James Gregory of Aberdeen in Scotland had given the first idea and figure in his opticks*, without having been able to find in his own country any workman capable of executing it aright. We now leave the cumbersome method contrived by Sir Isaac Newton, of making the aperture sideways, where

* See *optica promota*, print. in the year 1663.

where the eye is to applied, and resume the first invention of the Scotch optician. But however, it is Newton who first has directed the work of the artist, and enriched the publick with this admirable instrument.

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We don't in the least find fault with such as employ the hypothesis of universal gravitation, to explain the order of the heavens. They may do it if they please. We are so prodigiously distant from the planets, and according to Newton himself, so very great strangers to the nature of the things near us, that it is little to us, whether the unknown principle, which brings the planets near each other, and makes them turn round certain centres, be called by the name of attraction, or by that of pressure or impulsion. We do not cavil with him about a word. Prudence even requires that we should acquaint ourselves with his method, and make use of his observations, if they bring us nearer to the truth of phænomena, and the order of nature, than any other:

But what shocks us is, the excessive extent given to the system of attraction, and the several abuses of it.

They extend it too far. The celestial phænomena (a few irregularities excepted) answering exactly to Sir Isaac Newton's arguments; people infer from thence, that this attraction is generally reciprocal between all bodies, whether terrestrial or celestial: that it is a law really subsisting, or even a force inherent in all bodies, which is a very wrong consequence.

The ancient astronomers, with their different circles, their epicycles, and many geometrical demonstrations, foretold eclipses. They exactly marked out the course of the sun, and the situations of the planets. They thought themselves intitled

intituled from thence to conclude, that nature was ranged as they had conceived it. Nevertheless Copernicus and Galileo have convinced the whole world of the falshood of the system of Ptolemy and the Arabians.

Kepler had recourse to other hypotheses and new calculations, by means of which he geometrically adapted the whole order of the heavens to a new motion he had framed of them to himself. 1. He admitted in the sun a soul destined to make it turn upon its axis, and to send far away an image of the sun acting powerfully round about it. 2. This image, though immaterial, pushed the planets in proportion to the solidity of their masses, and of its own force, which diminishes all round as the square of the distance increased. He determined the length and consequently the weakening of the radius-vector, or carrying ray of the planet from the largeness of its orbit. He proportionally determined the increase of the mass of the planets by the lengthening of this radius-vector. By the calculation he built upon these hypotheses, he next formed the rule, which has proved exactly agreeable to the phænomena, and which is become so very famous among astronomers, that the cubes of the distances of the planets from the sun are among themselves as the squares of the times of their revolutions : so that by knowing exactly the duration of their revolutions, one may very nearly assign their respective distances, and their distances from the sun. 3. Kepler, in order to account why the planets describe orbits excentrick to the sun, imagined that the bodies of the planets were composed of fibres in form of bearded arrows, which lay all the same way, and flattened when their points were offered to the sun on one side, but which stood on end when offered to it on the other. When they

they offered to the ray of the sun the side of the flattened barbs, this was a friendly side, which, he said, caused *an attraction* towards the sun. When on the other hand the planets presented to the sun their fibres standing up on end, and against the grain, this was an unfriendly side, and this manner of presenting themselves to the sun caused a repulsion. So that the radius-vector, or carrier of the planet, attracted it towards the sun in one case, and drove it therefrom in another. The rule of Kepler, and whatever he establishes, that is agreeable to observations, was retained. But this conformity did not hinder judicious people from looking with an eye of pity upon all these suppositions of fibres flattened or standing up on end, of attractions and repulsions, notwithstanding the pompous expressions and geometrical apparatus which serve to set off these suppositions.

The attractions, repulsions, and immaterial powers so much used by Newton, owe their birth to Kepler. The observations, geometry, and calculations he has annexed to them, are without dispute superior to the work of Kepler: but have the attractive, repelling, and immaterial forces, acquired a greater merit or reality than they had before, for having been put into better company?

The partisans of Sir Isaac are not the only persons who realize to an excess this supposition or pretended cause of the motions of the universe, which he expresses by the obscure name of attraction, for no other reason than because he knows not what that cause is. He seems to have himself been the dupe of his own language, and of his too great familiarity with the attraction and the repulsions. He finds them every-where. 'Tis true, he in some place says, that the effect he attributes to an attraction

tion may possibly be that of a repulsion. But it is plain enough, that he was of a contrary opinion : for when he inquires into the origine of the cohesion of bodies, and into the reason why the little masses of the elements are more difficult to be separated than the large ones ; it is, says he, because the elements having no pores, exert upon each other an attraction, which acts by the whole depth of their mass, and the whole extent of their surface : whereas the secondary corpuscles, which are composed of the primitive masses of the elements, begin to admit of pores, and the small bodies of the third class composed of the secondary ones, admit of a number greater still. Whence it must needs happen, that the primary particles adhere much more powerfully to each other, the secondary attract each other less, and those of the third class less still. The attractions of course diminish in proportion as the masses increase, and at a distance a hundred times greater, a hundred multiplied by a hundred, that is, the square of the distance, gives you the exact measure of the weakening of the attraction. Sir Isaac Newton, in inquiring into the cause of the cohesion of the first elements, has no ulterior bodies left that can produce any impulsion. He then most sincerely rejected the impulsion, and realized attraction as an original source of the activity and combinations of which nature is composed. But it would be much better to remain idle, than with great labour to exercise one's geometry in calculating and measuring imaginary actions, which are no manner of information to us. Where-ever Sir Isaac Newton and his followers perceive, or fancy they perceive any geometry, they immediately mistake it for nature itself. Witness their reaction, which they make so much noise about, and which is nothing but

but a geometrical way of expressing the diminution of communicated motions, without our reaping any physical knowledge from it, or any light upon the nature of any thing whatever. Witness again their drop of oil, of which the acceleration between two laminæ of glass inclined one upon another they exactly calculate. Can one, they say, not here perceive the existence and true progress of attraction?

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Before we explain the accelerated motion of their drop of oil, we would ask them how it happens, that such a mass as that of the cathedral of Paris, which has an attraction infinite as it were in comparison to that of a feather, does not attract to itself this feather, which freely flies in the air along its walls? We would next ask them, why in the angle which joins the wall of the cross-windows with that of the nave of the church, we do not experience an attraction still more powerful than in another place. It seems, that a small body ought not to venture into this passage, for fear of being attracted, and rudely clapt against the walls, by a suction that would increase in proportion as the square of the distance diminishes. That cannot be, they gravely reply, because the earth, the great planet, makes all these attractions cease by the superiority of its own: and lest the thing should be doubted, calculations are made: the feather is weighed, then the cathedral, and then the whole earth: and the long train of cyphers, by which the cathedral is superior to a feather, is nothing in comparison of that by which the terrestrial globe is superior to the cathedral. The arithmetick is exact, we believe it, but the use made of it is very little so. If the cathedral has no longer any attraction in presence of the earth, why should two laminæ of glass have more privilege? How can they freely enjoy their pre-

prerogatives in presence of the large planet? Oh! say these gentlemen, it is an attraction of another kind. There are attractions acting from the centre of bodies, and by the whole depth of the masses. There are others which act only by their surface. Such is in particular that of the laminæ of glass. Let these laminæ be more or less thick; the drop makes its way equally. This is then an attraction of a particular kind, and there are still many other distinguished kinds of attraction. Some are electric, some magnetick, some We with all our heart consent that people should imagine as many kinds of attraction as they please: but let us insist only upon that which the Newtonians pretend by a singular law of God to have been fixed on the surface of certain bodies only. If this attraction is of a particular kind, why is it given for a proof of the universal attraction, which acts from the centre of all bodies? Let us here calculate the fine discoveries of the philosophy of the north. Central attractions, superficial attractions, attractions *in distans*, attractions of contact, sympathetical, magnetical, electric, or any other such attractions, which are varied as much as the effects, and which, to complete the wonder or the darkness, when they carry their activity to a certain degree of distance, of attractive, as they were before, on a sudden become repelling forces. Are we not now much better philosophers for so great a discovery? We have rejected the occult qualities of the ancients, though they, like the attraction, signified nothing but a sensible effect of an unknown cause: and behold, we again fall into the same gloominess, and the same inutility, in establishing as many attractions of a particular kind as we see particular effects! What do we get by this bargain? In the main, it is no more than a means of speaking long and emphatically of

of what we do not understand. 'Tis true, the attractions are calculated, and algebraically computed: but what hindered the ancients formerly from calculating and algebraically computing the sphere of activity of the occult qualities? Things every whit as exact might have been said upon them. The Newtonians are for ever teasing us with the augmentation or diminution of the attractive powers in an inverted proportion of the square of the distance. But this is the general progression of whatever is dispersed all round, and weakens in proportion to the spaces. It is the progress of odors, of heat, and very commonly of electricity. But after many repeated calculations of these progressions and others, are we a whit better informed what odor, heat, or electricity are?

Nay, more: Inutility is not the only defect of those modern attractions to which every thing is referred: and we may perceive that falsity is often blended with them. They give us for attraction what is the effect of a true impulsion, or of so obscure and so secret an operation, that we are no way intitled to produce it as a proof of the pretended attraction. There is undoubtedly a fluid, such as air, and the fire therein dispersed between the two laminæ of glass inclined as Sir Isaac Newton will have them. It is known, that one fluid acting upon another, causes an emotion therein: which seems to be sufficient to explain the acceleration of the drop of oil. If that fluid is composed of elastic globules, these globules become flat, and rebound when they meet with bodies. The globules of the invisible fluid between the laminæ undergo a small compression along the sides of the glass. They return back upon the fluid, and each minute shock of these springs spreads through the whole mass. But the wave that makes an impression on

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the ascen-
sion of
fluids in
capillary
tubes.*

a fluid, is stronger in its birth than in its dispersion. It is more sensible in a small than in a large space, wherein it weakens in proportion to the number of the particles to which it is communicated. The drop of oil must then needs experience a shock or impulsion always greater in proportion as it is nearer to the junction of the laminæ. So likewise, the liquor, which in a very small pipe touches a greater surface, with regard to the littleness of its mass, than it does in a large pipe, must needs be more agitated and more strongly pushed by the air or by some other fluid contiguous to it along a capillary pipe, than in a large one: because this other fluid is itself more agitated there, along the sides where it is pressed back, than it would be in one of a large size. There must needs then be a greater agitation, where the liquor and the air meet together upon the pipe. We see therefore the fluids which ascend in small pipes, form towards the middle of their mass a cavity, which shews, that what lies along the sides of the glass experiences there an emotion somewhat greater, and rises in mixing with the air, by which it is agitated. There is scarce a vessel wherein we do not see the liquors some small matter higher along the sides than in the rest of their surface. We readily confess that this operation is very secret, and very difficult to be found out. But if we dare not with perfect confidence give it as a cause of impulsion capable of making fluids to ascend, fetching from the suspension or agitation of confined fluids a proof of the attraction of the vessels, is seeking light in darkness.

Cause of
the bend-
ing of the
light at the
approach
of bodies.

The agitation of fluids along bodies contiguous to them, again supplies us with a means still fitter than attraction, to account for the bending and deviations which happen to a direct ray of light at the approach

approach of bodies, and before it has touched them. This bending is less at the approach of a rough uneven body, because the ebbings of the fluid upon all sorts of surfaces being every way made, they naturally must weaken each other, and cause less agitation in the light.

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On the other hand, the bending of a ray at the approach of a razor, or of a smooth body, must needs be greater, because the smoothness consisting in a great number of small uniform surfaces, the flattening and reboundings of a very great number of fluid globules are made the same way; which must cause a more sensible agitation in the light. This strong emotion of fluids, at the approach of surfaces, may be justified by that which is sensibly perceived in summer-time, and in extreme hot weather in the air, on applying the eyes to the surface of the earth, or of a wall inlightened by the sun. This agitation of fluids, such as air, fire, or others, in the pores of hard bodies, likewise seems to me much fitter than attraction, to account for the obstacle which the light oftentimes meets with in pores rather than on surfaces. The Newtonians delight in the sublime thought, that the light is reflected by a vacuum, and flies back on that part where it feels bodies. For my part, far from making the apology of the ancient school by this new-coined horror of a vacuum, I think that a body is never reflected but by a body: and if light is reflected by pores, even before it arrives at a surface, it is because the pores, when they become too oblique, are as good as shut, and because a fluid, which by its fineness is proportioned to the light, repels it from within certain pores, and even before it has touched the surface where that fluid is itself forced to ebb, and is more agitated than in another place.

The magnetism which the Newtonians reduce to an attraction, or to a law without any real efflux of substance and atmosphere, yet carries with it all the symptoms of the presence of a body. After having attracted the needle of a sea-compass towards the extremity of an iron bar presented to it, if we strike the same end of that bar once with a hammer, all is changed, the needle goes off, and a repulsion is made instead of an attraction. This blow of the hammer may disorder a course of particles that were revolving round the iron. But if the attraction is nothing more than a law, or a bare consequence of the will of God commanding the load-stone to advance towards the iron, how could the blow of a hammer disconcert the law of the Almighty?

The electricity, which is a sensible effect of agitated corpuscles, is with as little foundation attributed to an immaterial power. Were it nothing but a virtue exerting itself all round in an inverse proportion of the square of the distance, we should not see it lifting up a few grains of leaf-gold from a plate, at the end of a string of twelve hundred foot long, in the same time that the electrical tube is applied at the other end of the string.

We even cannot reasonably doubt but this electricity is an atmosphere of small corpuscles rarefied round the electric body after the friction. For when you let a particle of leaf-gold or some other minute body near the tube go in the air, the particles agitated round about drive and precipitate upon the tube the gold, whose parts are at rest near each other. But a moment after the air and moisture spread over such gold, go off from it by the activity of the ambient fluid, and form round it a bubble, whose sides are of water. This bubble dilates, and becomes lighter or more rarefied than
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the air it swims in. In which case we see the particle of gold shoot back from the tube, and likely swim on the surface of the electrical atmosphere. *The WORLD of NEWTON.*

This is what the Newtonians in a vague manner call repulsion. If you remove the tube, the gold which has leaped from it falls by the impulsion of weight. But if on the contrary, you oppose the tube to its fall; then the atmosphere round the tube meeting with the small atmosphere, which incompasses the particle of gold, one atmosphere rolls upon the other. You see in reality this gold suspended in the air far enough from the tube. If you lift up your arm, the gold ascends. If you let your arm sink, the gold descends. It imitates all the motions of the tube, because it is incompassed with an atmosphere, which supports that of the gold: and it is so very true, that a bubble of a matter extremely rarefied and gathered round the particle of gold produces all the effects just mentioned; that if you touch the gold with your fingers or otherwise, you in that case burst the crust of the bubble. The gold is restored to its weight, and immediately the atmosphere, which exerts itself round the tube, again precipitates the gold upon the glass.

They also account by attractions and repulsions for another experiment of nearly the same nature. Having suspended and freely let flutter in the air three or four ribbons of different colours, if you present to them the tube just rubbed, you may perceive that the black ribbon is always the first that draws near, and the others successively, according to their specifick weight, and in a constant order. Likely the ferruginous particles which compose the black die being metallick, give this mass, which is light enough to be carried away, a sufficient weight to be precipitated the first. A moment after particles of water and air go off from

these ribbons, which dilate to such a degree, that what they contain become lighter than the mass of air of which they take up the room: and immediately you see them recede from the tube, that is, in proper terms, floating on the surface of the great electrical atmosphere. Remove the tube, and the ribbons come again. Present the tube to them anew; they fly off. If you lastly draw your fingers along the ribbons, you burst or dissipate that small volume of air infinitely rarefied by the electrical bodies that meet there: at which instant the ribbon being freed from what made it fly off, is by the electricity again brought to the tube. We chuse thus to account for particular effects, by a few intelligible mechanisms in a manner attested by circumstances, rather than to account for every thing by a vague word accompanied with geometrical lines and algebra. All the benefit of this affectation of being for ever fathoming, weighing and calculating the motions of the celestial bodies is, that we give ourselves an air of profound learning, while we in reality remain in the most profound darkness.

Do not hope, say the Newtonians to us, that we ever will come again to your atmospheres, and your vortices. You must, in order to oblige us to admit of a vortex, previously shew us how it moves, and apply the whole to effects. Now this is what can by no means be done.

That this is impossible is a question, we will reply to them. However, we give up most of the notions of Descartes, and are prepossessed in favour of no man, nor any sentiments in particular: but the vortices he conceived round each planet are beings almost palpable. These we prove from the effects which suppose their existence: and though we do not despair of demonstrating or geometri-
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cally explaining the structure of them (a), yet we don't think ourselves obliged to do it. Do we need, in order to be able to affirm that there are fluids, geometrically to conceive how fluids perform their operations? Can we call in question, that a mass less compact than the portion of the fluid, whose room it takes up, is less forced downwards than the fluid itself, and that it must of course ascend? Nevertheless, we might be at a loss how to demonstrate this mechanism geometrically. We account therefore for the gravity of stones, and of the moon upon the earth, not indeed by geometrical lines applied to an unconceivable supposition, but by a centrifugal force that brings the densest bodies again towards the centre, as we just saw in the electricity. And if the particle of gold keeps up at some distances from the tube, or the moon at a certain distance from the earth, instead of being precipitated thereon, it is because a globular or oval vortex spreading around the earth, stops or lets the vortex of the moon roll over its outside, as the electrical atmosphere lets the bubble or the particle of gold roll over it without letting it precipitate.

The Newtonians every-where confess, that they know neither nature nor the major part of the causes of which they examine the effects. We commend them for this well-grounded modesty, and we allow most of the effects they admit of, because they have observed them exactly. But they ask from us explications of the mechanism and intimate structure of the atmospheres and the vortices, as if we pretended any right to the knowledge of these things. We are satisfied with collecting the greatest number of experiments we pos-

(a) Mr. Privat de Molieres has attempted it in his physical lectures.

sibly can. We try to make a body of them, and make them coherent. We imploy geometry when it may be of service to us. We most commonly content ourselves with such testimonies as demonstrate the existence of certain causes : as for instance, of an atmosphere, of a vortex, of a matter that revolves in avoiding the centre, and of other the like ; but still without pretending as yet perfectly to conceive the mechanism thereof. Above all, we are of opinion, that nothing is less necessary than to refer all the motions of nature, both in great and little, to an ideal gravity, to weights or masses gravitating one upon another without being applied to each other, without any intermediate bond, and even when they are separated by immense vacuums. This new method of philosophizing establishes a kind of action, which we no way perceive in nature, and which has upon no account the character of the conduct which God constantly observes in whatever surrounds us. If we see any motion communicated, it is by impulsion, contact, tension, or pulling, by wheels or pieces taking one into another, and above all by weights present or applied, not by weights felt before they are touched. Why should God have everywhere put so many levers, cords, strings and springs, and so many proportions of figures jutting in and out, if he had on the other hand established the law, which makes them gravitate upon each other before any contact, and even in a perfect vacuum ? There is no advantage to be reaped either by the mind or the heart from this new philosophy. Nor does it seem to us very prudent for any man to run headlong into the recesses and mazes of a gloomy geometry, in order to arrive at establishing a pretended universal causality, whose application to any thing of what is round us upon
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the earth proves altogether impossible. Take ^{The WORLD} Newton out of his heaven, whither very few people ^{of NEW-} are willing to follow him, and put him with his ^{TON.} universal attraction near the massiest of buildings, or confront him with the electrical tube, with a load-stone, or even with himself and the organs of his own eye, or of his stomach: then his attraction remains unactive, or acts the very reverse of his rules. We are not then a whit the better naturalists for being very great geometers.

But busying ourselves with fruitless generalities is not the greatest abuse that can be made of attraction. The worst consequence we possibly could draw from it would be our thinking that this attraction, whose reality is more than uncertain, has been the formative cause of the earth, has given being to comets, which, by the efflux of their substance, very seasonably supply exhausted spheres, and has in short given the planets a rank in the zodiack, a greater or less train of satellites, and a determined mass. There is no uniform motion, nor any either central or superficial attraction, that can regulate this wise and magnificent œconomy. The argument now-a-days fetched from the pretended figure of the earth, is no manner of proof that attraction gave our globe this figure.

Mess. Newton and Hughs having, by the recitals of some attentive travellers, been informed that the pendulums carried from Europe to la Cayenne, and to other parts of the world near the equator, slackened their motion, and beat the seconds more slowly, inferred thence, that the gravity was less under the equator. The reason of this phænomenon, according to Sir Isaac Newton, could be no other than a diminution of the attraction. Now the attraction diminishes only in proportion to its remoteness from the centre.

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Whence he inferred, that the earth was larger at the equator, since the attraction or gravity began to be less there. This phænomenon, according to Mr. Hughs, could have no other cause but the centrifugal force of a whirling matter, which in avoiding the centre precipitates thither matters heavy and void of action. Now this force cannot be weaker at the equator upon any other account than that of a greater remoteness from the centre. Whence he concluded, that the earth was thicker under the equator than in any other part, and flattened a small matter towards the poles. These two learned men, notwithstanding the diversity of their hypotheses on the cause of gravity, drew the same consequence from this matter of fact.

As the knowledge of the figure of the earth is of concern to navigation, and may contribute to the perfection of geographical maps; the king of France was pleased to send into the north, and towards the poles, learned men of known merit, to make themselves certain, by the relation of the degrees of one climate with those of another, whether the roundness of the earth was every-where the same. For if they must have travelled farther in the north than in our climate, to obtain a new degree or a greater elevation of the pole, it was a sign of a flattening towards that part: and if on the other hand, they must have travelled less to have a change of latitude, it was a proof of a greater roundness in that climate, and of a surface more even and more flat in ours. And finally, a perfect equality of ground to answer to each degree of the heaven, would argue a perfect uniformity in point of roundness.

Those of our learned men who have exposed their lives under the cutting cold of the polar circle, are happily returned, after having set up at the
extremities

extremities of their lines columns which declare to these remote nations, not indeed a destroying hero, but a prince friend to public good, who makes his glory to consist in being of service to mankind. The result of their work, and of the relations of those who have wrought for the same purpose in Peru, has a tendency to prove, that the earth flattens somewhat from the equator towards the poles, or that the surface of the earth under the poles is a small matter less remote from the centre than under the equator.

The learning of Sir Isaac Newton making a greater noise in the world than the opinions of Mr. Hughens, a considerable number of people have, from the recital of our illustrious travellers, inferred that this form of the earth decided the case in favour of Sir Isaac's opinion. Others have concluded not only that attraction was real, but also that it was this powerful principle which had flattened the poles of the earth, and widened its equator, ranged the Satellites round Jupiter, and given Saturn its large ring. Those who argue in this manner fancy they say something grand. But they don't see that there is little judgment and much danger in these consequences.

First, they are not judicious: For the flattening of the earth towards the pole does not establish the attraction of Sir Isaac Newton, more than the centrifugal force of the vortex of Mr. Hughens, or of Mr. De Molieres. What causes gravity always diminishes as the remoteness from the centre increases. Gravity is less towards the equator; therefore there is a greater remoteness from the centre there, than in any other part of the earth. But does this gravity proceed from attraction? Has it its origine in the centrifugal force of a vortex, or in some other cause? This still remains
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for us to know, and is what man perhaps will never know in his present condition.

But we moreover find these consequences not less pernicious than ill-grounded. Saying, that attraction has formed the earth and the planets, is falling again into imaginary structures, such as those we have in Lucretius and Descartes. It is preferring a frivolous figure of geometry, to all the lights of religion and experience. If the earth has been made broader under the equator than towards the poles, this is the work of a determined intention of the Creator, not of any physical cause whatever. Gravity by this means proves weaker there. Vapours must be precipitated not so quick in that place, but remain longer suspended over the head of the inhabitants, whom an excessive heat would scorch. It is some such intention, or some other of the same kind not known to us, that has given the earth, the plants, and all those lofty and admirable machines of which the universe is full, their form, use, and mutual correspondence. If a man might otherwise be allowed to inquire how the attraction can have widened the equator, or formed the ring of Saturn, what shall hinder us from asking, whether it is not attraction that has made the forepart of the eye-ball protuberant, or shot out upon the middle of man's face that fleshy cartilaginous bit which we call the nose?

Men are now out of conceit with generations effected by occult qualities, or by corruption. But are they much greater gainers by forming a planet of sediments, or by virtue of attractions, even according to geometrical lines? Let us for instance geometrically and by attractions form the belly of a turnep or an onion. What is a turnep or an onion? Nothing it seems is easier than to order the dimensions and figures of them. But if attraction can
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dispose the fibres, nutritive channels, and reproductive germen of a turnep, it will give us an acorn, an oak, and all the plants. If it gives the plants, why not also the animals and man himself? We at present know what the origine of a turnep or an insect is. We then much better know, that no natural causes have ever been able to form the magnificent globe of the earth. Let the geometer measure his own garden: let him calculate the quantity of the stones that will form an inclosure round it; and then nothing can be more useful or more valuable than his operations. But imploying geometry in constructing planets, is a strange abuse of that science. This carries with it a greater ridicule, than that of the cobbler who attempted to give the public the art of government. Formerly they studied geometry and calculation, in order to assist the study of the annual revolutions and others, or to regulate such operations as were necessary to mankind; *viz.* the plan of a town, the direction of a causey, the fabrick of a bridge. This method now-a-days is too vulgar. Men now apply geometry by supposition to the remotest of the celestial bodies. They range them in platoons. They suspend three of them together: and by an exact inquiry into the matter they are composed of, and a strict research of the exact point of their common centre, they put them in the scale against certain others, to determine their respective attractive forces, from the excess of the density of some over the density of the rest. That is to say, men study nature to have a pretence for calculating. They make of geometry the same use which that person made of his teeth, who, in order to shew his friends that they were excellent in their kind, exercised himself upon the sea-shore in biting and breaking

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breaking pebbles. 'Tis true, though a good set of teeth be a very valuable thing, the fashion is not yet established of making a boast of them in splitting of pebbles : but it is now a thing quite common to weigh Jupiter, or to calculate the density of Saturn, the porosity of Mars, and the quantity of cubick feet contained in the body of the sun : not indeed to regulate our kalendar, which does not require so much preparation, nor to be of any sort of use to society, which is no way concerned in such computations, but to give proofs of one's being a calculist and a geometer.

Such are the judgments of many philosophers upon the ground and abuse of Newtonism. It was our part to quote them without diminution, because the subject is very important. However, we do not pretend to warrant what may be excessive in them. Far from intending to offend any body, we have tried to make the reader sensible of the importance it may be of to him to study this philosophy, and the dangers he is to avoid therein.

What we may boldly affirm, according to exact truth, and conformably to the chief aim of this history, is, that in spite of Aristotle, to the shame of Descartes's promises, according to the most judicious among the modern, and by the confession of Newton himself, we don't at all know the bottom of nature : and that the structure of each individual part, as well as the whole universe, is altogether a secret to us. Whence it follows, that systems of physicks, whatever they are, are very much over-rated.

This conclusion, which might be the best of guides to us, by rendering us very circumspect in the use of reason, to which God has set so very narrow

narrow bounds, seems to be opposed by a difficulty which offers naturally enough. Is it credible, that God has shewed the world so penetrating a genius as Paschal, so patient a genius as Newton, and yet has intended to interdict to them the knowledge of the bottom of nature?

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He has undoubtedly done it. He is the dispenser of light and darkness. He renders us capable of knowing the use of his works: and it is in order to assist us in this work, that he now and then raises extraordinary genius's, or uncommon talents. But, let the sagacity of the discernment he has indowed them with be ever so great, still has he inclosed them within the bounds of his first plan. What is then this plan, we shall be asked, and who shall point out to us the bounds we ought not to pass in our researches? These bounds are set where an experience of six thousand years ought to have shewed them to us. They are placed exactly between the ground of beings and their outsides. The universal incapacity men are in of going further than what is sensible and useful, naturally informs them of the limits within which they ought to confine themselves. In what escapes their senses it is, that the secret of the structure, and the mystery of the operation, lies hid. Their reason may and ought to exert itself on the effects and intentions which God shews us; but never on what he conceals. He consents that we should learn by infallible rules how to measure our lands, gauge our vessels, weigh our liquors, cast up our days, and even how to observe the course of the stars themselves: because he has made all these things subservient to us. But he has not taught us what the nature of heaven and earth, of metals and fluids, was, as he has freed

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us from the care of producing them. Nor has he taught us what the cryftalline humour of the eye, a ftomach, a heart, a planet, or a vortex were, becaufe thefe things are made, and he did not defign us to regulate the action or government of them.

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THE
HISTORY
OF THE
HEAVEN.

CONSIDERED

According to the notions of the POETS,
the PHILOSOPHERS, and *MOSES*.

BOOK the Third.

The PHYSICKS of *MOSES*.

HOW! is there then no such thing as general physicks, able to connect the discoveries of our fathers and our own, and collect them into a body of science? There is such a thing no doubt. We know of a plain and modest system of physicks; physicks of infallible use, equally fit to comfort the heart of man, to adorn his mind, and supply his wants; even experimental physicks: the physicks of Moses. Nor is

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the one different from the other. Let us begin with observing what we are taught by the former.

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FIRST, an universal and uniform experience, which we have sufficiently examined in another work (*a*), convinces us, that all parts of nature are in correspondence: that they are dependent on each other for the exercising of their functions, and the accomplishment of their destination: that the loss or subtraction of a single one, would destroy the service of all the rest: and that, in short, the final term wherein the several uses of the pieces which compose our world do centre, is visibly man. I say of the pieces which compose our world; because we are to confine our researches within this compass. In vain shall we ask whether there has been any other before that we now see, or whether there are any others near it, and for what God designs them. Let us talk of what we are able to know. Let us leave the knowledge of the rest to him who has reserved the secret to himself.

If every thing is coherent in nature; every thing is the work of one and the same intelligence. If every thing on earth concurs to assist and exercise man; if man is the centre of all the services, instructions and relations; the visible intention of the Creator in whatever he shews us, is, that we may learn how to make use of them. This is the aim of all: and it is a prodigious honour to man to be the object of such a destination.

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the end of
phylicks.

Must the principle and the aim of phylicks, or of the study of nature, be different from the principle and aim of nature itself? Doubtless no. The

(*a*) The letter at the end of the third Vol. of the Spect. de la Nature.

whole

whole of physicks, therefore, aims at knowing God in his works, and at making an excellent use of his favours.

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But great efforts and an extraordinary genius are perhaps necessary to understand these physicks. Very far from it. Profound meditations, long calculations, and a sublime geometry, may lead us to some apparent general principles, but the application of this to particular studies has almost always proved unsuccessful, and from it mankind never reaped any benefit : so that all such as run after singular opinions, or who flatter their disciples with leading them to a most sublime knowledge, from one age to another, see all their marvellous systems punished with a constant inutility, and finally by a general contempt. It is not so with those physicks which aim at knowing God, and making use of his favours. They require nothing but an honest heart, nothing but eyes, and a diligent hand. Trying, making use of, and endeavouring for our brethren's sake to improve what we have received from our common Father, is indeed our true physicks, and physicks so very easy, that any man breathing may become a naturalist.

*Rule of
this study.*

The only sure means of succeeding in this study, is to avoid all out-of-the-way notions, and to place a greater trust in experience than in the most celebrated speculations. These speculations are commonly looked upon as keys : but have we a mind to make use of the key to enter every where ? it then proves false, and opens nothing.

We saw from numberless experiments, that created beings are connected with each other, and have, for the exercise of their functions, and their own preservation, been placed in a mutual dependence on each other. But we saw from an equal

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The PHYSICS of MOSES.

number of experiments, that no created being was indebted to another for its peculiar nature, or its organization. Water may carry a grain of gold where it was not : and fire may put together two grains that were separated. But neither the fire nor the water ever gave gold its nature. God alone discerns that. Who will be so inconsiderate, as to assign a natural cause of what he is a stranger to ?

The sun and the fire of a flambeau push towards us the light that fills the universe. The light shews us the flambeau, and the sun it is pushed by. But as the sun is not the work of the light, the corporeal light likewise is no effect nor any production of the sun. The light, always ready to cheer us so soon as the least fire shall agitate it, stands in no need of the sun to subsist around us. It exists there before he comes : just as the air is around us independently of the bell that pushes it upon our ears. And it is infinitely more ridiculous to pretend, that the sun produces the light every instant, and from one moment to another fills with it the enormous space of the sphere it enlightens, than to pretend, that the bell produces the air that strikes my ear, because it moves it quite to me.

Observation on the opinion of those who are shocked at the creation of the body of the light prior to that of the body of the sun, as mentioned in the recital of Moses.

No body will infer from the successive transmission of the sound from the steeple to my ear, that the air has left the steeple in order to come to me ; but rather, that the air agitated in the steeple, had clashed against or pressed the adjacent air, and then this air next to it ; and that, without any great alteration of place, the shock has reached a great way. Nor will any one conclude from the communication of the light's being made in seven minutes from the sun to us, that the light has quitted the sun to flow quite to us. There is in this no efflux, nor any projection ; but a shock, a suc-

ſucceſſive undulation, a preſſure, which, without transferring far from the ſun or from the bell what incompaſſes them, communicates itſelf from the ſun or from the bell to the ambient bodies, then to others, and finally to us. But the air and the light are no emanations of the bell or the ſun which ſtrike them. They are independent thereon. They may ſubſiſt before there is any trumpet to agitate the air, and make it reſound, or any candle to diſturb the equilibrium of the light, and make it ſhine.

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SICKS of
MOSES.*

There is a like independence of origine in all created beings. A hand-worm, a flea, ſhall not come out of its egg, before a juſt degree of heat has put the minute members of which its body is compoſed in motion. This is fact. But it is not the heat that organized the germen, and prepared the foods incloſed in the egg with the germen.

Motion pushes, ſtops, compoſes and divides : but it produces neither the elementary natures, which enter into the compoſition of all maſſes, nor the veſſels of the organized ſpecies. For this reaſon, the major part of treatiſes of phyſicks lead us aſtray. They promiſe to explain nature to us : and they only acquaint us with a few laws of motion. But, though we were as clearly informed as we are ignorant, in what manner motion unfolds the organs of a germen ; yet ſhould we not a whit better know what the forming cauſe of the germen or its ſtructure is. We conſequently ſhould not know nature itſelf, though we had made never ſo great a progreſs in the ſtudy of motion. The author of nature has viſibly eſta- bliſhed conſtant laws to regulate the aſſemblings, the claiſhings, and reflexions of bodies. The ſcene of nature changes every moment, and is inceſ- ſantly renewed. But why is it always the ſame in each of its viciffitudes? 'Tis becauſe motion

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SICKS of
MOSES.*

assembles and mingles things already made, and nourishes species of a determined structure. But motion forms no species at all : nor does it even produce the simple natures which supply the increase of each species. The laws of motion are ministers, and, as it were, so many domesticks employed to carry on the service of the earth, and to vary its decorations. But the servants who place and displace the goods in a house, make neither the wood of the wainscots, nor the wooll or silk of the hangings. If the laws of the clashings, the centrifugal forces, the attractions, the living forces, the repelling forces, the central powers, and others, which men make so much noise about, and mention with so much parade in physicks, without perhaps much understanding them, were capable either of forming the least living organ, or of producing a new elementary nature ; the universe, which is looked upon as the effect of these powers, would most certainly perish : for it subsists only by order. Now, what order would there be left, if motions and attractions could produce any thing? The original natures would vanish, and make room for new ones.

The thing dwells no doubt in the thoughts of those, who attribute to motions, and a concurrence of attractions, the form and determination of each piece in nature, as of a sun, or a planet. And really, new shocks or new attractions ought to produce new pieces. Nothing in the world is so much varied as the combinations of the shocks, and of the pretended attractions ; and consequently new beings and new natures must needs be ever formed. But since men have existed, what change has happened to gold? What new metal is come out of the crucible of so many thousands of chymists? Are not the number and nature of the matters

matters they now make use of, still the same? Do we see any greater alteration in the organized species? There is then in good truth but one single cause, but one infinite intelligence, who made a determined number of species and elements, and who afterwards has regulated the motions that were to contribute to their union or dissolution. Motion therefore varies what is already made: but it has neither produced nor determinately formed any one thing. And it is because the elementary natures, as well as the living species, came out of the hands of God in a fixed and precise number, that the whole is unalterable, notwithstanding the motion which serves to mix them. One or two examples shall complete the clearing of this remark, which is the most important consequence that can be drawn from experimental physicks; since a perfect harmony between the inspection of nature, and the lights of revelation, results from thence.

A chymist skilfully mixes together a few matters of no great price, and therewith makes a kind of metal, which, without the unpleasant smell of brass, shall have the beauty of gold. He will think of some name for this mixture, and call it tombac, prince's metal, or transmetal. Transmetal is a fine sounding word that may make the fortune of this man's new invention. Every one is fond of it. But pray, has this person increased the number of metals? Has he shewn us a new nature? Ask any of his fellow chymists. He with a shrug will declare all the metallick ingredients, and other things which enter into the composition. He will tell you, that such a matter is the basis, and that such another corrects the softness of it: that such or such another completes the dose, and makes the bond of the whole. Our chymist of

*The PHY-
SICKS of
MOSES.*

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mules.*

course has neither produced nor transmuted any thing: he only has ingeniously mixt together pre-existent natures.

God, in order to prevent certain scarcities, permitted a monstrous animal sometimes to issue from two different genus's of animals. Such is the mule. I shall just suppose, contrary to experimental evidence, that all mixt species may have a posterity, and that a mule may become a mother in a stud of horses, in a large herd, among the deer, or in any other species you shall please to name. Her young shall have the same liberty. Another species still more singular and more degenerate shall proceed from it: nor shall the lineaments of its two original forefathers be known again therein. The multiplication of this first species shall, of you please, give birth to a fourth, and by new mixtures successively to a twentieth variation. What will the consequence be? Why, the ass and the horse, who were the first originals of these stocks, shall be forgotten and neglected throughout some large country, where the adulterate species shall have prevailed, and been varied by contracting new alliances. In time (and a short time too) it may become very difficult and even impossible to find a horse of the true species. In short, the primitive species may fail, and even be totally annihilated.

Fecundity denied to the first monster, at once puts a stop to these mixtures, and prevents this dismal inconvenience. By this means the established order is preserved. The number and origine of the organized species therefore, as well as elementary natures, have not been abandoned to motion, nor to any other blind power. An infinite wisdom has fixed the number of them, and they

they are as immutable as the almighty Being who made them. The PHY-
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What a deal of time is spared ! How many quackings and vain researches are suppressed, so soon as we know that there is but one cause ! that all is made : that motion, which serves for the preservation of the world, shall never produce any other new being in it ; and that the laws of motion may very well be studied, in order to mix for the supply of our wants a number of natures already made ; but not to construct them ! Ay ! how could the laws of motion assist us to know what they have not even produced ? Thence appears the illusion of those who, after having calculated the effects of certain motions, or of some pretended attractions, give their work the sounding, stately name of *true physicks*, or of *mathematical principles* of the structure of the world. If they should say, that the Creator of the elements and of the living species has only shewed us the motions and use of them ; their physicks would be more solid, more modest, and more within the reach of our reason. Their philosophy would agreeably exercise us about what has been designed to fill up our thoughts : whereas your systematical philosophers all of them seem to have made it their study, by the most difficult paths, to lead us to the most needless conclusions.

Nor is it a trifling thing fully to have convinced ourselves, that the study of motion shall never lead us to the knowledge of the nature itself, either of the elements, or of the organized species, it having produced neither of them. We shall be but the more inclined wisely to keep within our own sphere, and to reduce physicks to the knowledge of the several uses we may make of the beings about us, if it once proves true, that the service of There is
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man is the sole purpose of the works of God. Now, the same experience which in every thing calls us home to one single cause, likewise makes all nature to refer to this sole end.

We have in another work (*a*) sufficiently proved from the bare inspection of the earth, that if man was taken away from it, all would be void of beauty, harmony, and design therein: and that man (if restored to the earth) becomes the bond of all that is thereon; because all it contains has been submitted to his power, prudence, government, and gratitude. Experimental physicks therefore supply us at once with sound morals, and with the means of exercising ourselves, either by operations already tried, or by such researches as may be of some advantage. This is then learning truly solid, and a serviceable philosophy.

But is it very sure, that we can distinctly know in what order and to what purpose the things about us have been made, and put in their places? Nothing so inconceivable indeed, if we consult the naturalists. Nothing so plain on the contrary, if we listen to experience, or the voice of nature. Let us ask the philosophers, How and why all these things were made? They all of them, as well ancient as modern, lead me astray into a labyrinth of disputes, because they consult their own thoughts, instead of attending to experience. Some judge the man to be very bold and forward, who looks upon himself as the centre of what God has placed round about him: and though they see none but man that can make use thereof, their modest philosophy thinks it proper to inquire, whether the gosling is made for man, or man for the gosling. Why do they not speak out? They

(*a*) First letter at the end of the first Vol. of the Spect. de la Nature.

may, after a question like this, put man cheek by jole with a hog, without any distinction of either rank or duties. Others think, that, in order to explain the works of God, they must overlook his intentions, and with a self-sufficient air, set up for explainers of every thing, by means of the square and compasses. As there is some exactness in the lines they describe, they fancy they have found out the plan of the Creator. These great architects, let us say rather these crawling emmets, who know how to put two straws across, and dispose a few bits of wood for their own lodging, attempt, each after his own manner, to construct the sun, and to give us the plan, sections, and elevations of the universe. One of them looks with an eye of pity on the work of the other. Let us no longer listen to their quarrels. Let us hearken to the voice of nature.

The supreme Being, who has been pleased to make man, has prepared an habitation for him. He then first made the earth, where he intended to lodge him. He has so advantageously placed this earth, as that it might have a share in the spectacle of the world; and that being designed for the palace of man, heaven and the rest of the universe might serve it both as an ornament and a covert. Let us not presume to speak of what God has made in other places; since we have no manner of knowledge thereof. It is enough for us to know what concerns ourselves. God, from a necessary consequence of his intentions with regard to man, has introduced into the world that light which was to render every thing visible in it. He constructed the air which man was to breathe, and the fire that was to give him life. From the same scheme proceed the metals, salt, and all the terrestrial elements, which were designed throughout all

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all ages to renew and maintain whatever should be necessary for the inhabitants of the earth. It plainly appears, that it was in order to render their service intallible, that God made them indestruc-
 tible.

But the earth, though already supplied with these costly elements, is not however as yet fit to receive the inhabitant who is to possess it. Let the sun not yet be made, or already have given its light ; the earth is still no more than a desert or a solitude. A desert ; since it is not covered yet with any plant : a solitude ; since we as yet see nothing animated in it. The heat and rain might cause some germina to spring thereon, if they could only find them already made. But God alone can produce a germen. It is a work as difficult, and as truly reserved to his immediate power, as the world itself.

But that will which makes and regulates every thing with caution, manifests itself what place soever we direct our eyes unto. This will it is that *has kept the lands above the sea, in order to make room for the inhabitants*, and gauged the capacity of the reservoir, that it might be proportioned to the fluid he has collected therein.

The same will has suspended in the immensity of the heavens another sea of attenuated and invifible waters, which fill the atmosphere without altering its transparency : and the existence of these waters difperfed all round us even to great distances from us, though they are not seen yet, is testified by the collection made of them upon the outside of a bottle juft brought out of a cellar to the external air ; and into which the fire of the air no fooner infinuates itfelf in order to fspread therein an equilibrium, but it abandons the water which it kept rarefied without, and which becomes
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sensible by condensation. The existence of these waters dispersed about us is testified in the air-pump ; when the small quantity of air remaining there dilates, loses its spring, and has no longer activity enough to support the particles of water which it sustained, and which that moment fall again one upon another, floating like small clouds in the recipient. The existence of these supernal waters is testified by the evaporation of the sea, which is never more considerable than under the brightest sun, and during the most serene days. Nor is it less attested by the winds, which render their reality sensible, by agitating the lower strata of them, and precipitating them into rain or dews. Such are the admirable preparations for a durable and universal watering.

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The same will, in order to prevent the earth's being dried up by the winds, after rain should have followed fair weather, has in sundry places disposed eminences and mountains, which receive and retain the water within their bowels, in order to distribute it with œconomy to the inhabitants of the plains, and to give it such an impulse as might enable it to overcome the unevenness of the lands, and convey it to the remotest habitations.

The same will has proportioned the variety of the plants to the exigencies of the inhabitants, and regulated the variety of the soils upon the wants of the plants.

The same will has endued a great number of animals with mild dispositions, in order to make them the domesticks of man, and has taught the other animals how to govern themselves, giving them an aversion for dependence and bonds, in order to people the whole earth without lading man with too many cares.

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The PHYSICS of MOSES.

Are not the many thousands of other precautions, measures, compensations, and liberalities, the work of a bountiful intelligence, which intends to lodge and exercise a society of men? Or are they not rather the effect of an attraction inherent in matter, or of an homogeneous matter moved in the manner of a vortex?

But if common sense, in concert with experience, has at last perfectly convinced us, that a mushroom had its seed, and is the work of an express will of the Creator; much more is it agreeable to common sense to think, that he who has been willing to create man, likewise intended that he should be lodged, furnished, served, lighted, nourished and supplied with whatever he judged proper to give him. All the pieces of this world which work for man with so much concert, are so strictly dependent on each other, and in so perfect a correspondence, that we cannot one moment doubt, but that he who willed one of them in particular has likewise especially willed to order each of them in particular, and has determinately made one whole of them all.

We then find in the structure of all the pieces which compose the universe, and in the universality of their relations to the service of man, the most demonstrative characters of a wisdom which has regulated nature, and the function of every individual thing, by as many wills and express commands. Motion, which this wisdom makes use of to put every thing in action, perpetuates and maintains the scene of the world under its wise laws. But this motion has never produced nor will ever produce any thing: and it is itself a mere effect of the constant, though most free will of the Creator. This is what good sense, the voice of nature, and experience, concur to teach

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us about the origine, destination, and preservation of all the beings on which we may pass judgment. Now, what experience so clearly tells us on this head, is exactly what we find in the recital of Moses.

The PHYSICS of MOSES.

II.

G O D, according to this recital, begins by I. Day, creating the heaven and the earth. But, in order to prevent for ever the false opinions that were to attribute to the earth a fruitfulness and to the heaven a power residing in God alone, he condescends to reveal to us, that for a while he has left this earth in a state of imperfection: that it was neither *adorned* nor *peopled*, but wrapt up in an abyfs of water: and that the waters were covered with darkness. If this mass is to be disengaged; if the earth may become visible and acquire some beauty; it is only in proportion as the supreme artificer shall be pleased to embellish it. Doubtless he could produce and dispose every thing in one instant. But this successive creation, which is no way necessary to the perfection of the whole, or of its parts, was a great information to man, who needed both to be instructed and lodged. The memory of this infancy of the earth still unformed, has been preserved among all nations. There is no reason why we should not even with the ancients call this state of imperfection by the name of Chaos. But let us with great care avoid altering the idea or tradition of it, as the poets have done, or perverting it more still, in contriving with the philosophers a vague indeterminate matter, whose motion should gradually, and by fermentations, sediments, or attractions, have produced a sun, an earth, and all the decorations of the world. This

Tohu va-bohu. Desert, and solitude.

The Chaos

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ridiculous chaos, from which experience taught that the most violent motion could never fetch any thing but another chaos, is not in the least that of Moses. All that was made from the beginning was good in itself. But all was not made, and the imperfection consisted only in the want of correspondence or coherency. The earth, destitute of the service of the plants and animals, was not habitable. But what it did contain was perfect. It was a sortment of determined natures, which no motion whatever has been able to produce or change. The water was made, tho' it was afterwards lodged otherwise. The common mould was made, since God soon after took some of it to construct the human body. The elementary natures were then distinguished from the very first moment of the creation: and the same power which added something to its work, in putting upon the outside what was wanting there, had at first supplied the insides with whatever had any relation to its purposes.

It is with the celestial spheres as with our globe. They were made, because the heaven which they compose was created. But our globe not being habitable, these spheres were not as yet so many stars. They were still no more than rough and dark masses. The light was not yet made, nor do they in the least produce it. The body itself of the light might be created, and yet no sun or moon exist, if the materials with which God intends to construct these immense bodies, are, as well as the earth, large collections of elements perfect in themselves, and adapted to a certain purpose; but not as yet ranged and applied to any use. These globes might from that very time be already supported in the middle of their atmospheres, and their atmospheres mutually uphold
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and prop each other. But hitherto all remains dumb, stupid, and benumbed. Nor will any creature any where appear, but in proportion as the almighty voice of the Creator shall summon it to do so. They all of them owe him not only their being, but also their functions.

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Let there be light, he then said, and there was light. Though the eye for which it is made be not as yet created, God nevertheless already sees all it can perform. He approves of his own work, and gladly beholds the immensity, suppleness, activity, and excellence of it. So soon as this vast fluid, which penetrates and contains all the spheres, begins to turn, the universe is in motion: and from that very instant it is, that the revolutions, which are the measure of the night and the day, are reckoned. But here motion is neither the maker nor the cause of any new being. The sole will of God bidding the body of light to circulate regularly, at one and the same time produces the motion, harmony, and mechanism of the whole machine.

Motion has formed none of the pieces of the machine; but that will, which has formed all the pieces, has likewise set them a going, and for ever regulated the laws of their progressions.

This immense light, which is no way owing to a pre-existent motion, is no more indebted to the sun for its being. It is independent of him, and perhaps gives instead of receiving any thing from him. If the sun is a fire always ready to disperse itself; the light, which fills up every space, is fit to press it, to repel it on all sides, and to retain it in one place. It is much fitter to help, as a second cause, if not the fermentation, at least the maintaining of the sun, than the sun is to produce it.

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II. Day.

Again, the earth is hitherto no more than a heap of materials, which the want of order renders altogether useless. God takes half of the waters that cover it: he volatilizes them: he disperses them all around, and by attenuating them so far as to put them in equilibrio with the air, and to make the latter their support, he causes them to mount to the last strata of the vortex or sphere which encompasses and keeps the earth in its place. Thus he puts an immense space between the last strata of the superior waters and the surface of the waters which remain always condensed and dispersed round the outside of the globe. In this body of air and water, which serves as a support to the earth, it is, that God at one and the same time prepares the source of an universal cooling, and the reverberations that will give to the day its brightness and splendor. The light is made. The instruments which are to distribute and regulate its action according to the wants of the earth, are all in readiness. God will make use of their ministry so soon as he pleases. But the stars are as yet but rough-hewn pieces. In good truth, there is as yet no sun, nor any moon.

III. Day.

The will of God, which gives all things the degree of goodness they obtain, is going to disengage the earth from the last veil that covers it: nay, he does more. He gives the mass itself that form which makes it an instrument subservient to his designs. He speaks, and behold the hillocks rise, the valleys sink, and his hand, in order to collect the inferior waters, hollows a deep reservoir, which no circular motion, nor any attraction or settling of elements whatever, could have ordered.

The earth, laid open by the retreat of the waters, decks itself with an innumerable multitude of plants, garnished with leaves, flowers, seeds, and

and fruits. Did the moisture which the waters left behind them produce this noble work? But though we should to moisture add fermentation, and perfectly well understand the meaning of this notable word; though you should add to fermentation and moisture even the sun, which does not as yet appear; and though you should to all these active causes add the repulsions and attractions, the central forces and gravitations; all these causes united will never produce a plant. How shall one go about forming a pink or a rose, a grape or a strawberry, together with their forms, smells, and invariable qualities; especially with a germen capable of reproducing the whole, and of perpetuating the species from age to age, without the loss of any, or the production of new ones?

Philosophy, which formerly fetched all these wonderful works out of a small quantity of mud put in motion, at last does homage to the physicks of Moses. If there are upon earth twenty thousand different species of plants, (and we know very nearly that number e'er new discoveries are made) experience at length, in concert with scripture, teaches us, that these are twenty thousand different works, made after so many different models, and by so many express commands. Why then does the most modern philosophy still teach us sometimes, that we might suppose in the universe nothing more than matter, and a motion spreading through its parts by virtue of impulsion only, and then undertake orderly to deduce from this bare supposition all the effects we admire therein? I honour much those who think so: but I am afraid they have not sufficiently considered the consequences of such a pretension. I am persuaded they have not by these effects understood the organized species, such as plants. But if their physicks

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physicks abandon them when the germen of a gnat or of the grafs they tread on is to be made ; do they then fancy that they understand better what an earth, an atmosphere, a body of light, or the sun are, when they thus presume thence to deduce the fabrick of the principles of their system? Philosophy, which at last is returned to the physicks of Moses, when the organization of a grain of millet is to be explained, will, I hope, have recourse to the same physicks, that is, to the special wills of the Creator, when it is to account for the structure of the earth, and for its correspondence with all the parts of the universe. It is strange that men should hesitate in this point, and rack their brains by long calculations, in order to fetch from some supposition of a motion, or of an attraction, the cause that has put the sun in the centre of the planetary world, that has provided the earth with a large looking-glass fit to perpetuate the light of the sun upon it during the night, and has given Saturn a luminous girdle. Here arguments, calculations, and geometry, lead us to illusory causes. But experience and Moses, without any fatigue or dispute, teach us the truth we are searching after. If it is the immediate hand of God, and not a small quantity of matter put in motion, that has produced the fine attire of a tulip, the pinking of the leaves, and the green of an anemone, the invariable nature of a grain of turnip-feed ; for certain it is no longer a motion, a pressure, or a sediment of dusts, but a most special intention, that has regulated the dimensions of the terrestrial globe : and those physicks are infinitely rational, which say, according to the common opinion of mankind, that he who has prepared and constructed the flowers, has also formed both the garden which bears them,

them, and the large reservoir which contains the matter of their watering.

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All these plants newly created stretch out their roots, and thus fetch nutritive juices under ground. But a cutting cold still hinders them from exposing themselves so soon to the air. They retain their flowers and the bundles of their leaves under thick envelopements. Some are for that purpose provided with wads of wooll and with down: others have received a kind of shell, or wooden covers, or large thick leaves that shelter them in the manner of tiles, or a plaister of juices sometimes gummy, sometimes fat and refinny. They all keep their buds hidden under these shelters. Hitherto nothing as yet is stirring, and the principle of life which animates them, remains there buried in a kind of numbness.

IV. Day.

God at last unswathes the earth and the stars. The waters, the vapours, the saline or sandy dusts, and all the matters in which the plants were rolled up, and which served them as veils, vanish and retire to their respective places appointed. The atmospheres grow perfectly clear. What new phænomenon are we now going to see?

God, says Moses, ordered that there should be luminous bodies in the firmament of the heaven, to divide the day from the night, and to serve for signs proper to mark out seasons, solemn meetings, days, and years. And behold, from that very instant the sun begins to shine immediately upon the earth. The moon and the planets, in company with the stars, are ready to cast a remainder of light upon the side of the earth which the sun is going to quit. From that very moment the earth has its lights to regulate the order of the days, works, and feasts. The sun, together with the light directly cast upon the earth, conveys a vivi-

fying heat thither. All the cases in which the buds of the plants remained wrapt up, begin to unfold. The leaves and flowers begin to blow. All the earth is covered with grass, and inameled with the briskest colours. In the physicks of the poets and philosophers, it is the sun that has the honour of having covered our abode with these noble productions. In the physicks of Moses, the sun is not the father of the flowers we just saw opening. He finds them already made the day before; and the birth of flowers is one day earlier than that of the aurora.

Let us not think ourselves to have impoverished the sun, by taking from him a little philosophical and fabulous splendor. The physicks of Moses rob us of nothing in not mentioning the relations of the density of the sun, with that of the substance of the æther, nor the figure which fluids are to assume in turning elliptically upon the axis of the sun or of a planet. What benefit could we reap from making the finest calculations upon uncertain hypotheses? But shall we not be very great losers, if, running into researches in appearance very learned, we remain ignorant of what Moses teaches us, that God, in creating the sun, honoured man so much, that he would make this magnificent flambeau serve to light his handy-works? That he was no less mindful of him when he reserved the soft light of the moon for the time of man's repose: That he has varied the phases of this last flambeau, and the situations of both, in order to distinguish the works of man as well as the seasons, and to enliven the expressions of his gratitude by the successive returns of the feasts: That notwithstanding the enormous remoteness of the stars wherewith God has strewed the heaven, he deigns to impart to us the sight of them, that we
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may have certain fixed points, which are to us in lieu of signs or guides ; and that we may follow in the heaven the course of the two flambeaux which regulate our life.

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These first instructions of the physicks of Moses are the necessary foundation, without which the most extensive learning is nothing but uncertainty and useflessness. But after having acquired the important knowledge both of the origine and destination of the light, the atmosphere, the sea, the drying up of our abode, the plants wherewith it is decked, and the flambeaux that fix the duration of our years and days ; it is a sequel of the same physicks to observe and collect the several effects of those magnificent instruments God has provided us with. We act in perfect conformity to the instructions and intentions of Moses, when we study the uses of the light with the opticians ; with Torricellius, Paschal, and Boyle, the pressure of the air and the other fluids ; with Halley, the swinging of the flux and reflux ; with Agricola and Reaumur, the several uses of so many minerals, fossils, and earths, which want only the eye of the observer, and the hand of the artificer ; with Tournefort, Ray, and Jussieu, those characteristick signs, which, by helping us to distinguish the plants, lead us to the knowledge of their properties ; with Hipparchus, Ptolemy, Copernicus, Galileo, Grimaldi, Flamsteed, and Cassini, the number and situation of the visible stars, the rout of the planets, and the limits of their courses ; in a word, the whole service of the heaven, and the rule of times. Have not these great men procured us a multitude of helps, by modestly confining themselves within the limits of our power, and of our wants ? But those who, from a single point which we know, have concluded that we were

capable of knowing every thing, and who, losing sight of the design of our intelligence, have undertaken geometrically to lead us from cause to cause, so far as to make us comprehend the inward frame of the whole universe; what have they given us? Great promises indeed, a world of weariness, and a few glimpses fitter to lead astray than to enlighten. Let us then come again to our master. What instructions does Moses prepare for us on the first day?

I would fain here invite the greatest philosophers, for instance Aristotle, Descartes, and Newton, to come and see the work which the Lord has begun, and which he has not without design left suspended. Tell me, ye sublime genii, who know the elements and the consequences of their mixtures, the laws of motion, and the effects of all the shocks: see to what degree the universe is arrived, and inform us what will follow. Look into your logick and your geometry; and thence by way of consequence fetch the work which is to follow those that precede.

They hold their peace: nor am I surpris'd at it. The celestial intelligences, though endued with lights far superior to those of these very famous philosophers, are themselves in expectation of what new phænomenon God is preparing for them. They are struck with the beauties of the earth and of the spring, which makes it a delightful paradise. But having found either in the laws of motion, or in their lights altogether celestial, nothing that might lead them so far as to make them guess at the odor, the splendor, the freshness, and form of roses, before the hand of God had unfolded the first bud of these flowers; no more does their science hint to them what is to follow. All they see is the work of a wisdom perfectly free in all its views

views and designs. They admire what is already made. They are sensible of the beauty thereof. They possibly may comprehend the correspondence of the Creator's works, when he has made an end of them. But there is none but himself that knows what he is going to shew them, and how he will execute it.

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What a surprize to them, and what applauses V. Day. for the eternal wisdom, when after the production of so many beings full indeed of life, but bound to the surface of the earth by very strong ties, they saw a multitude of new beings equally full of life, but freely transporting themselves to different places, and on this account capable of peopling the whole earth! All the children of God rejoiced, and glorified him for having proportioned the figure, the shape, the inclinations and industry of animals to the different parts of the globe. The air, the sea, and the great waters, the smallest rivers, the stagnant pools, the forests, vales, plains, and the rocks themselves, all, in short, have their proper inhabitants. They are so many artificers dispersed through all parts of an immense manufacture. Some are mild and tractable; others are wild, morose and solitary. These different inclinations detain them all in their proper quarters. By this means their services can never fail. They live, because God has both designed and ordered their birth. They all of them have such or such peculiar way of life, from which they never swerve; because God has prescribed them their functions, and for certain purposes imparted a certain measure of industry to them.

It would be an employment worthy of the angels, and a philosophy in every respect truly satisfactory, to be able to conceive the intentions and liberalities of the eternal wisdom, by a constant study

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study of the particulars of all these animals, by the knowledge of their birth, habitations, polity, anatomy, and of the several utilities that may be procured by them. But instead of praising the Creator for these marvels, and of every day increasing the benefit of them, our ancient philosophers, with the whole extent of their intelligence, endeavoured to make mankind conceive how the privation of form, and afterwards the application of a substantial form to a mass of mud and of primitive matter, converted it into a *vivens*, and of an animal *potentiâ* made it an animal *actu*. The moderns, who commonly have more geometry, in which they are very laudable, very often employ this geometry to account, by lines and calculations, how the attractions and repulsions produce an ovarium in the animal, an egg in the ovarium, and a germen in this egg : or how they bring about the secretions, dissolutions, and nutrition in the stomach of an animal ; in which they seem very much to misuse their science and time. The knowledge of these operations evidently is refused to us : and let the consequences drawn from such or such a supposition be attended with ever so critical an exactness, man can derive no manner of utility from them : since he knows not one whit the better how to construct a germen, or how to manage a stomach. Let us then knock at the door which may be opened to us, and make our advantages as numerous as the particularities of natural history. If we have a mind to trace things back to their true causes, let us learn them from that philosopher, from that wise legislator, who, near four thousand years ago, taught that the earth and its elements, the heaven and all its ornaments, the light and the atmosphere, the excavation of the vase of the ocean, and the rising of the habitable lands, the sun and all the stars,

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the animals and the plants, in short whatever exists, owes its being and peculiar form to one single cause, to one eternal intelligence, which by so many express commands, has assigned to each individual part of nature its proper place, virtue, and organs, in order to bring the whole with an infallible perseverance to one and the same end, which is to render the earth habitable.

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But for whom are all these preparations? To whom is this magnificent habitation destined? For whom are all these domesticks, and this large inheritance? God, according to Moses's recital, at last introduces his beloved upon the earth. He puts man there. It is for him it was constructed, for him it was provided with stores capable of continuing throughout all ages. He gives him a companion, whom he fetches out of his own body, in order to render her as dear to him as himself, and whom he associates with him in the universal dominion of the earth, in order to render her considerable in his eyes. He for whom God designed the use of all he has created in this abode, is at last put in possession of it, and all is made.

VI. Day.

Gen. i. 28.

Nothing more shall then be produced therein throughout all ages. All philosophers are in suspense and divided on this point. Let us consult experience thereon. Elements constantly the same: species which never vary: seeds and germina prepared to perpetuate every thing: assemblages, nutritions, and dissolutions, which, 'tis true, vary every day; but in such a manner that one may at the same time say, *Nothing new under the sun*: no new generation: no kind whatever that existed not from the very beginning. Now, this truth, which the experience of so many ages has so constantly taught us, the legislator of the Hebrews knew, and decided it in these few words: *On the seventh*

seventh day, says he, God ended his work which he had made, and rested on the seventh day from all his works which he had done.

From that time the world has revolved. All is in motion on the earth, and within its very bowels. All is unfolded and nourished upon its surface. The supplies of the inanimate masses and of the living species are thereon dispersed, separated, reunited, and mingled, according to constant and simple laws, whereby God has for ever regulated the effects of motion. If he ever swerves from these laws, it will be when the exception appears to him better than the uniformity. But he has provided for every thing. All proceeds from him as from its immediate cause: nor will ever motion, nor the hand of man, or any other imaginable cause, be able, through the long series of years, to add to God's works either the least of worms, or the minutest grain of earth or metal; because a worm and an elementary grain are natures known to him alone, *and because he has entered into his rest, after having produced whatever was necessary for the duration of the world.*

This philosophy of Moses is far more satisfactory than that which pretends to explain every thing to us by lines or by numbers, by vortices or by attractions. These causes may be studied to a certain degree, if God employs them in nature. They may be made use of to explain by way of conjecture, and as probably as possible, the motion of the universe. But the knowledge of motion is not the knowledge of the creation: Any system of physicks, in which the causes prepared to maintain the world, are looked upon as the causes themselves of the several parts of nature, makes us deviate from truth; since it refers the origine and formation of every thing to such causes as can
ingender

ingender nothing, and dries up our hearts by substituting an imaginary mechanism to the intentions and adorable purposes of the Almighty. Whereas, in the physicks of Moses, goodness constantly attends exact truth.

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After he has acquainted man with what he owes to God, by informing him that whatever is in the heavens, on the earth, in the sea, and in the air, has its nature, place, and degree of excellence, immediately from God : after having made us sensible, by the order of the works of the Lord, of which man is the last, that they are so many preparations designed for us ; he next to gratitude inspires us with humility, in acquainting us with the precaution God has made use of to prevent man's becoming the admirer of his own excellence, on account of his being so favourably treated. *God, says Moses, took some of the dust of the ground, and therewith formed the body of man.* This truth, like all the foregoing, is still confirmed by experience. When the body of man is dissolved after his death, there remains of it only what constituted the primitive basis thereof; even a little dust or ashes. Nought and dust: such is our origine, and the term of our terrestrial life.

Men, 'tis true, would fain have it, that Moses, in teaching us these so affecting truths, had likewise taught us what the light and fire, what gold and earth, what our life and soul are ; in short, that he had told us all. But if he who has made the elementary natures, and the living species, has judged that the service, not the knowledge of them, would be useful to us in our present state ; of course it is evident, that Moses has taught us what we are concerned to know, and has omitted only what does not belong to us. On the other hand, that philosophy which loses sight of the intentions

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tentions of God, and of the relation of all the creatures of this world to one and the same end, and undertakes to explain to us the bottom of beings, and to make them all come out of one and the same clay put in motion, ridiculously pretends to force a barrier which God keeps shut to us, and is contradictory to all nature.

Has any one, ever since the days of Tubal Cain, when metals were first handled, been able to know what a particle of fine gold dust was? Man nevertheless pretends to know what the soul and the universe are. But a complete proof of the vanity of the promises of those who pretend to construct the world by motion, or by some other general law, is, that when you seriously ask them what a particle of gold is; they in all schools answer you, that it is a parcel of the primitive matter, to which a certain turn has been given. Here Aristotle and Descartes go hand in hand. They will say the very same thing of a grain of sand. If they add in their definition, that gold is yellow and fusible; that sand is inflexible and transparent; my eyes had told me this before I went to school. They of course have taught me nothing.

The palpable difference which I find between the philosophy of Moses and the systematical philosophy, which they emphatically call the great physicks, is, that Moses agreeing with experience, leads me to the truth which I want, by shewing me, that whatever is upon the earth came out of the hands of God, and has been put there in order to serve and exercise man. He renders me grateful, active, and happy: Whereas the pretended great naturalists, by attributing every thing to matter put in motion, murder the time of their disciples, and torture their brains with an unintelligible fabrick, wherein nothing is connected

ned with the designs of God, nothing inspires the heart with any sentiment, and in which every thing is done without God's having any share in it, or seeming to have had man in view.

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I remember the endeavours I sometimes have seen people making to excuse Moses, whose creation did not square with the fabrick which had been since contrived. This they did at least to acquit certain points of improbability. *Moses, they said, is not against us: he must not stand in our way, because he has treated these things, not according to the great physicks, but according to the popular notions.* Let us see whether those ideas which are thought not very exact in his recital, are indeed so popular as they are said to be. For instance, the distinction of the inferior waters from the superior, which in the recital of Moses are infinitely attenuated, and placed far above the clouds: the independence he establishes between the body of the light and that of the sun: the repose of God, or the cessation of all new productions since the creation of man; these notions are indeed in no respect popular. Moses has not been contented with them out of popularity. They are on the contrary truths very surprising, and very opposite to all prejudices. We neither see nor even suspect the collection of these rarefied waters, which experience demonstrates to be dispersed all round us, and in the purest air. We from habit readily look upon the light as an emanation of the sun; because it communicates to us the impression it receives therefrom: and the great Newton himself thought he had found reasons which authorized him sufficiently to think on this point as the common people do. We naturally think we every day see new beings; because we see to-day unfoldings, increases, or disunions, which did not appear yesterday.

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yesterday. On this account it is, that the Heathens were shocked at hearing the Jews say, that God produced no longer any new beings, and that they were scandalized at seeing them celebrate the repose of God by every seven day's rest; a rest, which in the minds of the Heathens, passed for a *shameful representation of God's weariness* (a). Here Moses, without any scruple, speaks directly against the prejudices of both the learned and the ignorant. He informs us, that the body of the light existed before the sun; and that it drew not its origine from it. He teaches us the existence of a supernal sea, which had escaped the eyes of the philosophers, and which they could not be reconciled to in his recital. He in short, by the work of six days, and the rest of the seventh, teaches us what no philosopher ever deigned to acquaint us with, viz. that all is connected in nature; that the same intention which has constructed every one and all of its individual parts, has made them referring to the service and instruction of man; and that man, for whom the whole is destined, being created, the work of God is finished: that God, after this, will set all nature a going, but shall never produce any thing more therein. What he mentions in so few words about the creation of the woman, in order to render marriage for ever honourable; the intentions, he says, the Lord had of placing man upon the earth, to cultivate and improve every part of it, are mighty plain instructions indeed: but they are infinitely superior to the morals and physicks of the philosophers; since these few words are at one and the same time the basis of all true society, the manifestation of the

(a) *Septima quaque dies turpi damnata veterno,
Tanquam lassati mollis imago Dei.*

Rutil. Claud. Itiner l. 1.
design

design of God in his work, and of course the rule of all the duties of man.

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Who can have taught the legislator of the Hebrews principles so very fruitful, and of so great efficacy with regard to good manners, together with a set of physicks so singular, and yet so very intelligible, since every point of it is justified by experience? Is he indebted for the knowledge of these truths, to a tradition perpetuated among his people, from the first man down to those of his own time? Is he indebted for it to any express revelation, or only to the clearness of his genius? Chuse which side you please. For my part, I begin to listen to *Moses*, as the most credible of masters, even before I have examined the proofs of his mission.

THE CONSEQUENCES

Resulting from the

HISTORY OF THE HEAVEN.

BOOK the Fourth.

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FROM the comparifon we have juft made of what the ancients thought concerning the pretended celestial powers, and of what the philofophers of all ages have imagined concerning the production of all beings, with what the Holy Scripture and experience teach us about the origine of the world, and the ufe we are to make of it, we fee how extravagant the opinions, and how needless the refearches of men have been. The Author of nature as it were led them by the hand to their true object, both by refusing to fatisfy their infatiable cupidity, or to answer their questions concern-

concerning the bottom of his works, and by the success with which he from day to day rewarded their manual operations, and experimental researches. But instead of quietly keeping within the order of their condition, and within the bounds of their power, they have all entertained hopes of arriving at the most sublime knowledge, or at the most singular prosperity ; and in their busy disquietude, have not only imbraced nothing but shadows, but have all of them lost the solid satisfaction which is inseparable from modesty, laboriousness, and gratitude, in which all our philosophy consists. Let us from the last of the learned go back to the first man, whose writings have been handed down to us : and after having put all the philosophers on one side, let us again put Moses on the other. The latter is the only person whose philosophy does not lead us into errors. Experience contradicts them all, and speaks in favour of Moses.

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One half of the philosophers being surpris'd at their meeting with nothing but profound darkness, whenever they attempt to penetrate further than the testimony of their senses, indecently curse the condition of man, and condemn him to an universal ignorance. But Moses and experience on the contrary encourage us to work, and to make researches, by informing us, that God has subjected to us whatever is upon the earth, and that he crowns the operations of our hands with never-failing rewards. The other half of the philosophers taking too great a complacency in the lights and penetration which are granted to us, give man to understand, that his capacity extends to every thing. But Moses and experience inform them, that they are upon the earth, not indeed to know the bottom and grounds of God's works, but to

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improve them by their labour and management : that man is not born a philosopher, but a husbandman ; and that his wisdom consists in making virtue and labour go hand in hand.

The preaching of the gospel has, I confess, added a vast increase of lights to the first revelation : and the grace of the Lord has multiplied the examples of an uprightness, and a sanctity of manners, which the most sublime philosophy had even no knowledge of. But the splendor and strength of this preaching had no other aim but the reformation of man's affections. It has altered nothing in the order of our learning : and natural sciences, though susceptible of great increase, yet continue to be confined within bounds, which they shall never transgress.

When the divine Word, by whom every thing was made in the degree of perfection suitable to every being, came down to visit his work, he reformed nothing but what was out of order. He has not reformed the œconomy of nature, the corporeal world, because every part of it was according to order, and faithfully followed the first law of the Creator. The work of God was as constant as his will, which never changes. This the psalmist expresses in the following words, which are full of energy and dignity * : “ For ever, O
“ Lord, thy word is settled in heaven. Thy
“ faithfulness is unto all generations. Thou hast
“ established the earth, and it abideth. They
“ continue this day according to thine ordinances :
“ for all are thy servants. ”

* *In æternum, Domine, verbum tuum permanet in cœlo : in generationem & generationem veritas tua : fundasti terram,*

& permanet. Ordinatione tua perseverat dies, quoniam omnia servium tibi. Ps. cxix. 89, &c.

Man

Man alone has wanted a reform : because he had liberty. To his indifference for truth and for solid blessings ; in short, to the disorder of his will it is, that the divine Word has applied his wholesome grace. But he has not changed the order of his sensations. He has not destined him here below for a completer knowledge of nature. He has not, in forming man, deviated from his first plan. This divine wisdom, all the words of which are so many rules fruitful in lights, sentiments, and good works, in those days when it deigned to converse with us, has never uttered the least word, which granted to man's curiosity, concerning the structure of the universe, any thing more than what the primitive relations had done. 'Tis true, it invites us to the consideration of the beauty of the works of God, and of the wonders of his providence. Behold, it says, what the grains of corn thrown into the earth become. See the birds of the heaven, and their methods of subsisting. Consider the lilies of the fields, and their magnificent attire. But what does it design this study for ? What is the aim of the researches it advises us to make ? Is it in order to distinguish ourselves by profound learning, or in order to arrive at the intimate knowledge of the nature of whatever we behold ? Such a knowledge was fit only to give us distraction, and to lead us astray into empty speculations : whereas the purport of all the advices our Saviour gives us is, to make us work with a perfect confidence in the providence of our heavenly Father, and to encourage us to the service of our brethren.

Being once informed by the ancient tradition, by the new revelation, and by the experience of all ages, that God, when he put in us a principle of knowledge, and a stock of curiosity, has never-

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theless confined our science to what was sufficient to supply the matter of our works, and to assist the practice of every virtue ; that whatever goes beyond these bounds is nothing but misery, and an opposition to the order established : We may after this very easily know the just value of our studies, and contract a truly judicious notion of sciences, in order to retrench whatever is useless or false, and to make ourselves certain of whatever is solid in them.

All our studies, I mean those which have not the evangelical truth especially for their object, may be reduced to the belles lettres and philosophy. A practice resulting from our wants requires that we should understand the ancient writers, and the languages of those people, whose thoughts, inventions, polity, and history, we are concerned to know. By another no less rational custom, we by the assistance of the best masters in philosophy, early acquire a sufficient knowledge of the discoveries and observations made before us, in order to facilitate our labour, by previously making our advantage by that of others. But several mistakes reign in these studies, which often ruin the principal benefit of them, and which we find the corrective or remedy of in the history we have just made of the origine of nature, and of its destination.

If the belles lettres are valuable only in proportion as they may assist our knowledge, and make us reap the benefit of our labour, one of the first abuses is to confine ourselves, as we but too often do, within a superficial study of the ancient languages. We thus deprive ourselves of the only means we have of applying to our own use the experience of those who went before us, and who have borrowed the assistance of the learned languages,

guages, to impart their discoveries and thoughts to us. We gladly bestow all due praises on the labour of such as endeavour to improve their own taste, by the reading of the ancients. Italy and Greece have given birth to works, whose beauties well discerned cannot but adorn the mind, and cause it to acquire some delicacy. But there is danger, or rather a real loss, in confining ourselves within what belongs only to taste, or in being wholly taken up with what is merely agreeable, and with mere ways of thinking. In thus setting bounds to our studies, we run the risque of falling into affected wit, of being satisfied with glittering lights, and with filling up our lives with frivolous amusements, as those do who pass away theirs in making themselves perfect in the practice of chess or of tick-tack. The study of languages ought to be more serious, and more extensive. It ought to take in almost all the turns and terms that have any relation to the religion of people, to the productions of each country, to respective exchanges, to the invention of every age, and to the customs of the several ages.

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'Tis true, the multitude of the terms and objects renders the task a little hard : but this method carries its recompence and the amends of our trouble along with it, by an uninterrupted series of discoveries. We can hardly find out the meaning of one single term that puzzles us in Pliny, without learning some useful truth at the same time, whether the observation of Pliny happens to be confirmed by the experience of after-times, or rectified by the latter or not. Nor is a judicious mind less pleased with making itself sure of understanding a point of natural history, that is, of one of our proper blessings, than it is with having in the reading of Horace perceived all the delicacy of some happy epi-

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thet. Studying nothing but the modern physicks, and overlooking delicate learning, and the reading of the ancients, is depriving one's self of a provision already made of experiments, models, and sciences. It is introducing a rough uncouth kind of learning, and substituting in the schools rusticity to barbarity. On the other hand, confining one's self to the charms of language, and the beauties of the productions of wit, without making the whole subservient to the knowledge of God's works, to the study of the human heart, and to the supply of some of the wants of mankind, is forgetting that we have a soul and bowels: it is sacrificing our time, brethren, and duties, to a vain pleasure, and to the most unfruitful idleness. What does a man's being a wit, or reading amusing things, signify to mankind! It would avail as much as if he was a *petit-maitre*, always conversing about gaming or hunting, about balls and plays, ribbons and head-dresses; the utility and charity being nearly the same on either side.

Another disorder common enough in the study of the belles lettres, and which most frequently is a mere consequence of the first, consists in employing still in the ordinary language, or in what you call witty productions, the notions of the poetical world, and the names of the heathen gods: which does us more damage than we are apt to think.

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The abuse of the study of the poetical heaven is, that among men who pretend to reason, delicacy, and religion, there is a considerable number, who, all their life-time, feed upon the rubbish of paganism, and enervate their reason by approving of no other style, but that which they call the language of the gods. They know all the classes of the heathen deities, and the long series of their adventures. The metamorphoses are the common ornaments of their

their gardens and galleries ; nor are they willing to see or read any thing but what is imbellished with some few strokes of the heathen antiquity. Their indifference for all the rest shews they are persuaded, that out of Rome or Athens, out of the notions of Homer and Ovid, there are no longer any charms, nor any sense or satisfaction to be expected. But do they know that they thereby give us a very disadvantageous notion of their religion and capacity, and even of their taste?

I shall never be suspected of blaming a sober study of the heathen gods, and poetical heroes, since it is indispensably necessary for the facilitating the reading of the authors of the golden age, and the understanding of the tombs, medals, and all the ancient monuments. I only complain of the use made of these heathen figures in our furnitures, and of the introduction of these ancient names into our style. First, do not those, who on all occasions make a shew of the objects of paganism, give room to think, that notwithstanding their not having sacrificed to Cupid or Bacchus, they are no whit less filled with heathen sentiments? May they not be suspected of being idolaters in their hearts? 'Tis true, they all of them give it out, that they honour virtue ; that probity is precious with them ; and that they should be very sorry to see their children swerve from good manners, or indulging debauchery. But what opinion can we entertain of their conduct, or of their secret dispositions, when their conversation and libraries, their concerts of musick, and the ornaments of their houses, are so many instructions of voluptuousness, and the encomiums of every kind of vice? Left we should mistake the object of their religion, they make a publick profession of it, in causing an adulterous Venus, or some infamous rape, to be painted
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on the four sides of their coach. However, I shall believe, that this idolatry of theirs is only a stoop to custom, and that fashion has a greater part in it than the corruption of the heart. I chuse here to blame nothing but their judgment : and likely they do not approve of those vices of which they expose the emblem every where ; since, when their daughters happen to practise the instructions, which they have taken care incessantly to repeat to them by the assistance of musick, painting, and romances ; they are sincerely vexed at it, even so as sometimes to die for grief. Sure, it is a strange mistake to display whatever can render vice alluring, and then to think that forbidding only will be sufficient to prevent it. But though we should style this disorder only a whim, or a want of judgment, there will always be contradictors enow, to which this censure will still appear excessive. There is however nothing but a vitiated reason, and a corrupt taste, that can revive these figures, and poetical names.

We have seen that the gods and goddesses (though men thought they had at length unmasked them, and found that they were historical personages ; yet) originally had no manner of connexion with the history of any man that ever lived on earth : that they were not even so much as allegories or emblems, destined to teach physicks and morality : but that they in their institutions were nothing but significant characters, appointed to inform the people of the course of the sun, the sequel of the feasts, and the order of the annual works. If the poetical adventures are only stories full of scandal and absurdity, contrived on purpose to have something to say of these figures, whose meaning was no longer understood after the invention of the current writing ; is it not an excessive puerility,

puerility, nay, a criminal imprudence, to be for ever renewing these little stories, which are no less hurtful than useless, which in every respect clash with reason and good manners, and have no other tendency but to pervert such as take a liking to them ?

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Besides the unavoidable ridicule of employing figures void of sense, and terms destitute of signification, are not all the rules of good taste offended by this odd medley of antique and modern pieces, of real and fictitious personages, of reasonable and airy notions, which education, nature and religion equally contradict ?

The use of these fictions, they say, is on the contrary a proof of a nice taste in those who admit them. They corrupt no body, because they are given only for fables : and as they are connected with the language and manners of the Greek and Latin authors, a man shews his erudition, and pleases his reader by lively representations, in imitating the style and notions of these admirable writers. The heathen gods are almost inseparable from the belles lettres. Any body may be allowed to be a man of letters, and nothing more. A man of wit, who confines himself within that sphere, may then without harm revive this ancient language, which he has luckily contracted the habit of, and seasonably imploy a few fabulous touches, which give the imagination a larger field to expatiate in than truth can do, which is always more simple, and more reserved. Besides, what will become of painting, if you take from it this only means of speaking to the eyes, by presenting to them intellectual beings, under the emblems of sensible objects ? What will become of poetry itself, which is nothing but a perpetual picture, if you take from it the personages of fable ? Taking
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from us beauties like these, is giving a mortal blow to good taste.

To be sensible whether these notions are solid or frivolous, it is sufficient to refer them all to one rule, the exactness of which I believe no body will dispute, *viz.* that good taste can never be satisfied, when reason and common sense are offended.

1. It is a very wrong notion, that the use of fables is of no consequence, and no way detrimental to the mind. Though the ancients were very far from believing all the adventures attributed to their gods, what was said of their deities had (at least with regard to them) an air of probability, and was agreeable to the common persuasion, or the publick religion: whereas these notions are now-a-days acknowledged frivolous. What a strange entertainment for reason, and for reason too in its dawn, to be for ever exercised upon objects it knows to be absurd or void of reality! I no longer insist on the danger to which virtue is exposed by images which shock and dishonour it. I content myself with saying, that the habit of busying one's self upon false and imaginary objects, confines the mind, renders it trifling, and alters the natural integrity of it. A man solely taken up with fictions and metamorphoses, is so much accustomed to these too sensible ideas, that things barely reasonable appear to him cold and lifeless. He contracts an indifference for truth. The simplicity of nature becomes insipid to him; and reason either has no longer any influence upon him, or loses with him all its privileges. The proof of what I advance, may be found in the trifling character of those who assiduously frequent publick shews, and are much taken up with balls and plays. Carry them from Paris into one of our provinces, and you quite distract them. And indeed, how can any body live, when

when the sun is no longer to be seen getting his chariot ready, or when one is no longer guided by the divine daughter of Jupiter? A country lady, who is barely judicious, obliging, and unaffected, tires them even to death: and in the superiority of their taste and discernment, they think her very unhappy or very silly, to delight in places where the sun shines, and where common sense dwells. That's too trivial. Plain nature and pure reason have an ignoble outside that chills their blood. They long for things romantick and marvellous. They must needs hasten back to Paris. A husband will in vain represent the exigency of his affairs, and his inclination for rural amusements: there is no resisting the temptation: there is no continuing any longer in the country. The mother and the daughters think solitude a horrible prison. He is obliged to give over all his projects; and, in order to restore to the ladies the pleasure of an empty shew, he abandons his delightful country; that country whose improvements are promoted by the presence of the master; that country in short where he is sovereign.

A disgust for what is solid is the necessary effect of the enchantment of theatres and fables. Will a young gentleman, whose whole education consists in these fictions, be a hero, or a petit maitre? When the young judge is taken up with these shining trifles, the laws and his study are gloomy and melancholy objects in his eyes. The same contagion spoils the noviciate of a holier state. Thus men pass away their youth among the gods. At their leaving the schools, they find them again on the stage, where these speak a language which requires no master, nor any application to be understood. All publick shews repeat their adventures. You find them in your cantata's, songs, in the decorations

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decorations of your apartments, gardens, and publick piazza's. Ingravings, pictures, poems, musick, pleasant writings, learned dissertations, all in short conspire to shew us under an honourable and pleasing outside, actions punished by the laws, and absurdities diametrically opposite to common sense. All these cares, and considerable expences, aim not at persuading us of the reality of Jupiter's gallantries: but their intention is, under borrowed names, and the shelter of a mask, to fill our thoughts with pleasures, and indulge our passions. Thus they at mighty costs maintain our hearts in a spirit of irreligion, and our minds in a continual series of wanton sports, whose result must needs be an idle puerility that weakens our character, infeeblees our talents, and, by giving us a disgust for all our duties, intirely ruins the reality of them.

An exception, they say, must be admitted in favour of the beaux esprits, or of the men of letters, who may without any danger, and even with some utility, exercise themselves in the noble stile of the ancients. But how can they not see, that it is they themselves, who, by this reservation, occasion the whole evil we are complaining of?

There is a great difference to be made between their amusements, and the labour of an academick or a professor in rhetorick. A man may even very well be contented with less; with grammar for instance, or with musick: because a grammarian and a good musician are men of use to society. But, except a few persons who make it their business to instruct us in antiquity, it is not, methinks, natural to set up in the world on the footing of a man of letters: And though one should be possessed of the most valuable literature, yet will that intitle nobody to talk in the nonsensical strain.

In

In the first place, I say, that setting out in the world for a man of letters, and being nothing more, is playing an ill part. Wit, erudition, and letters, are useful means to arrive at something better. They help us to converse with men of all ages and nations, to make our advantage of their knowledge, and afterwards to impart the same lights to others. Except on these occasions, wit and letters are weapons, of which it ill becomes us to make a shew. No body in the world will boast of being possessed of an excellent jack. He that has a very fine pump is glad to use it to water his garden : but he derives no other advantage from it. What would one say of a man who should apply his fortune to the procuring himself the best hounds, and should pass away his time with them in the kennel, without either selling any of them, or without ever hunting? I have known another, who had made a considerable collection of watch-maker's tools. He would needs have them of the most perfect smoothness, of the best temper, and of an exquisite exactness. He caused them to be sent him from England, and shewed them his friends with much satisfaction. He even discoursed sensibly enough about watch-making ; but he never made any watches. He had never intirely taken to pieces one single pendulum clock ; nor was his own clock extremely well managed.

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A singularity of this kind is rare, I confess, and it will seldom happen that a man informs the publick, that he will shew to all comers a cabinet hung round with joiners tools. But nothing is so commonly met with as people ridiculously fond of passing for men of letters, and who speak or write for no other end but to make a shew of wit.

People speak not for speaking sake, one would be apt to say. They do it with an intention of uttering

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uttering something useful. The title or rank of *man of letters* is not a condition to which people can confine themselves. Literature and the beauties of speech must be made subservient either to the pulpit or the bar : just as you make use of a gun to shoot with, and an ax to hew down a tree. But the belles lettres may sometimes be made a bare means of amusement. Are not there innocent diversions which we may allow ourselves in after labour ? We shall doubtless find a greater variety of them in a delicate literature, than in a shop every-where adorned with chisels and planes.

That is true : but when men of letters, not satisfied with looking out for diversion in works already composed, attempt to become authors themselves, and to entertain us with amusing productions, can they think it a sure means to this end to be perpetually calling in their Greek and Latin mythology ? I shall not insist any longer upon the pernicious consequences of this their fond cant ; and I am contented with complaining of their endeavour to enslave the minds of their readers to this antiquated jargon, instead of conforming their style to sound reason, to our wants, ideas, and various characters. Do they fancy either that they shew me a grand object, or affect me very powerfully, when they make Jupiter and Neptune debate upon the interests that put Lewis XII. at variance with the Pope, or when they introduce Mars bawling like mad in the plain of Almanza ? Tho' these Gods should shake the firmament, one by a single frown of his beetle brows, the other by his divine roar ; these great words give me neither pleasure nor terror, because Jupiter, Neptune, and Mars, are no longer with us any thing more than three puppets, fit at best to come down in a miraculous

raculous manner by a cord, to amuse children at the theatre of Brioché*, or at the opera.

These tales, far from being, as they pretend, a source of beauties, of the sublime, and of grandeur, are no better than a source of meanness and disgust to any one that thinks, and is a friend to truth. People are tired with ascending mount Pin-
 dus, and with hearing Clio's songs, or listening to the instructions of old Terpsichore. Far from admiring, we look with an eye of pity and scorn upon a publick sculpture, wherein a king, whose memory is dear to us, is exposed quite naked amidst his people, with a heavy club in his hand, and wearing a full-bottomed wig. What notion would our beaux-esprits have us to entertain of them, when they pester us with verses, in which they try to move our compassion by the tears of Amydone, by the last words of the Phaethontides, or by the sighs of Syrinx? What concern do they think I can take in the change of Medusa's hair into serpents, or in the fate of the daughters of Phorcus? Do they imagine that people would give themselves the trouble of commenting upon their learned complaints? Why so much apparatus to say scarce any thing, and most commonly indeed to intimate what ought to be passed over in silence? They perhaps imagine, that by larding their style with these out-of-the-way expressions, they convince the publick of their great learning, or shew that they have been conversant with books: a rare instance of erudition indeed! nay, the highest degree of impertinence.

It is however just to plead for every one. What will painters do, if fable is thus taken from them? But on the other hand, is it just to prey upon common sense, and to feed our eyes with pernicious illusions, in order to indulge the fancy of painters?

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** A fa-
mous man
at Paris for
playing of
puppets.*

*See la porte
St. Martin.*

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Let them paint nature, and ancient and modern history. Let them give us a series of natural history. Let them paint arts and trades, the customs of nations, and the thousands of strokes that characterise the human mind. Which of them could thus ever exhaust the stock of these noble subjects? They are truly inexhaustible; and yet men think themselves wholly destitute, so soon as they are to do without dreams and visions.

The chief reason for which painters are still authorized to employ fables and allegories is, that they cannot expose intellectual subjects to the eyes; and are obliged, in order to render them sensible, to give them a body and a dress.

But, not to insist on their being in every respect debarred of this liberty, let them from the bad success of their allegories see, that this necessity is not near so great as they imagine. Who cares for guessing in the allegorick pictures of Mr. *Le Brun*, and of many others, at what they fancied they intimated to us? All these enigmatick figures make that a fatigue which ought to amuse or instruct me. A picture being designed only to shew me what I am not told, it is ridiculous, that the understanding of it should at all be a task: and most commonly when I have obtained the meaning of these mysterious personages, I find that what I am taught is not worth the expence of the allegory. Sure, in painting more than in any other art, we cannot add to nature without the risque of spoiling all.

Cast your eyes upon the *Coriolanus* of Pouffin, and you will see hard-by the people who are to appease this angry general, or are about him in a kind of retinue, a woman lying on the ground, and leaning her elbow upon a wheel. You will first ask yourself what this woman means? and after much study,

study, you at last guess that she is the symbolical figure of the way or high-road of Rome, by which Coriolanus made his army to advance, in order to invade his own country.

In the picture of young Pyrrhus transported to Megara, you see near those who try to save him by fording the river that obstructed their passage, a lusty man lying by the river side, and presenting one of his shoulders to the current that rolls over it in great waves. All the personages have a speaking lively action : and you even see more motion in that picture than in the other works of this great man, whom they reproach with having to an excess given to his figures the cold air of the antique statues he had so much studied. The figure of this man who seems to receive the flow on his arm and shoulder, is the only enigmattick piece in the whole picture, and you must think of it a while, e'er you reflect that this possibly may be the god of the river.

Poussin undoubtedly thought he gave both subjects a great embellishment by this outside of learning. But what need have I here of a learning which is nothing to the purpose, which breaks the connexion of the real personages by the mixture of a fictitious one, and obliges me to unfold riddles, the solution of which is no information to me ? In vain you alledge, that the back of this god is admirably well muscled, or that the head-dress of the goddess leaning on her wheel is exceeding well done. When I see the water of the river, a god needs not, in order to inform me that it flows, to come and shew me his muscles ; and when I see people in a march, no goddess nor any machine is necessary to inform me that they are on the road. To please, it is not enough that a thing

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be well made ; necessity, common sense, and reason, must besides have had a hand in the work.

But if these embellishments may be false, and foreign to painting, because the eye ought never to be diverted by what can any way clash with common sense, are they not a thousand times more preposterous in poetry ? They are much less pardonable in poetry, as it may represent whatever it pleases : and why should it have recourse to fabulous images, while it may with perspicuity, with a good grace, and wonderful energy, expose the most ingenious things, such as our judgments, our sentiments, truth, virtues, and vices ? Lucretius is a very bad philosopher, as he builds upon principles void of sense, and the whole concludes in unintelligible consequences. But he without the assistance of the gods, or of the least fiction, is a very good poet, because he makes lively pictures of nature (a) : and who can doubt but a man may, without the luggage of these ridiculous deities, join to the nobleness of style, and the beauty of the images, all the other parts that make a great poet ? I mean the invention, the knowledge of manners, the art of episodizing, that of giving the reader a concern by well-contrived situations, in short the fine disposition of the whole.

I had a right after discoursing on the poetical heaven to point out the abuse made of it, which becomes every day greater and greater ; and here to join my solemn wishes, that I may see real beauties and solid learning every where substituted to these frivolous and adulterate imbellishments. But though I am fully convinced, that the abuse made of the figures and names of the

(a) I know that Lucretius is commonly said to be a good philosopher, and a bad poet : but I appeal from this judgment to the judicious reader.

heathen deities corrupts our understanding no less than it does our manners, yet am I sensible, that in order to inculcate this my persuasion on others, this question, instead of being transitorily mentioned, and slightly touched upon, ought to be thoroughly discussed, and above all handled by people of unquestionable discernment, and of well established reputation. If a body of learned men, of experienced erudition and good taste, should take upon them the examination and decision of the case, they would make a far greater impression on the publick than a single private man possibly can do. Their bare example joined to their dissertations, would be sufficient to fix the usage as to this point. For which reason this magnificent question naturally devolves to the decision of Mess^{rs}. of the academy des belles lettres. It belongs to them alone with success to pronounce, whether we ought intirely to banish out of our compositions the use of fabulous names, or to inform us how far and with what cautions they may still be tolerated.

Another no less fatal disorder, but which very happily diminishes every day, is to believe, as all the authors of general physicks have done, that our reason was given us evidently to know the bottom of natural things from their particular causes, instead of being sensible that the whole sum of our learning amounts to the knowing every day better and better the relations which natural things have to each other, and to ourselves, and that reason was given us to govern and make use of what we are taught by experience.

The most famous among the philosophers of later times have preached nothing but evidence. *Admit of nothing, they say, but what is evident; nothing but what you evidently conceive; because whatever is evident is true, and one truth being*

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connected with another, you thus from evidence to evidence finally arrive at knowing every truth. Next to this, they take for evidence what they have ranged and disposed in the most consequent manner they can from very uncertain suppositions. But this modern method, which so loudly cries up the advantages of an evidence which extends to every thing, breeds nothing but illusory systems, and eternal disputes. We never ought to undertake the study of philosophy, in hopes of evidently conceiving effects, natures, and causes. For where is the thing which is evident to us? Can we flatter ourselves with knowing clearly what God, the soul, a body, a mass of lead, or a ball of clay, are?

We have a most distinct consciousness, nor is it in our power not to perceive, that what thinks in us, what is willing and unwilling, what rejoices and grieves, what discerns good from evil, is not the same thing as the body, which is a mere mass that sleep and death render incapable of any operation. We are conscious that we did not create ourselves, that we have not made understanding, nor liberty, nor the organs of our body. We are conscious, that we from without receive impressions of beauty, order, and utility; that the action which causes us to experience these relations, is superior to us; that it is impossible for us to open our eyes without being struck with the noble œconomy of nature; that of course there is a supreme, powerful, wise, and bountiful cause, which we call God. We likewise feel the heat of the sun: we compute our days: we measure our lands: we range with success the things which God has placed near us. A sense of the existence both of created things, and of the cause which governs them, and the trial of their relations with regard to us, are the sum of our knowledge. We distinguish what exists: we
reason

reason very well upon the uses they may be put to, and it is self-evident, that to this end we were indowed with understanding. But let us do ourselves justice. Reason was not given us to know the bottom, or distinctly perceive the nature, of any thing whatever. It may be said that our true logick does not consist in studying how the mind performs its operations, but rather in fully convincing ourselves of its destination, capacity, and limits. It is an instrument which God has made, and which is very well made. It is altogether needless metaphysically to discuss with Mr. Locke, what our understanding is, and of what pieces it is composed. It is just as if you should dissect the several parts of the human leg, in order to learn how to walk. Our reason and our legs perform their functions very well, without so many anatomizings and preambles. The whole art consists in exercising them without requiring of them more than they can perform. Upon this principle we may increase our knowledge almost in the same proportion as we multiply our experiments. We every day find out new uses, as we acquire new lights. We on the same account become dearer to mankind, or at least have the advantage of procuring ourselves useful employments, and of becoming better. For each discovery or new light pointing out to us some new bounty of the Creator, we may in the same proportion grow more pious, more grateful, and more resigned to the decrees of his providence. The principle of experience therefore has no other tendency but to make philosophers modest, useful to others, and enjoy a solid satisfaction themselves : whereas the persuasion of an evidence, which we do not perceive, and which is not in the order of God's ways with regard to us, fills our minds with empty hopes, breeds none

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but presumptuous systems, and leads us to endless difficulties, to an almost universal inutility, and often to the most extravagant unbelief.

People have often endeavoured to make faith and reason sympathize : but their efforts to this end were unnecessary : they were altogether needless, since the conduct of God with regard to man is constantly the same, whether it be in the order of the truths belonging to our salvation, or the order of physical truths. They are all equally impenetrable to our understanding : and God in our present state is contented with making us certain of the revelation or the reality of them, by letting us have a glimpse of their beauty, and by making us sensible of their excellence, without unveiling the bottom of them to us.

It is inconceivable, and in a manner impossible, that the sun should from one moment to another convey to the distance of thirty or fifty millions, nay of millions of millions of leagues, an action, a heat, and colours always new. We as little conceive, and it is a kind of absurdity to us, that the light should be able to gather in an eye but half an inch broad, or in an intelligent being, in a spirit, the sense, measure, and sight of the whole world. God, however, can do it, and does it in reality. Of this he makes us certain by the testimony of our senses. Here is then a thing most certain, very distinct, and yet incomprehensible. We likewise find some obscurity in the incarnation of the eternal Word, on account of the disproportion of two natures so vastly distant. But God can communicate himself to his creatures in what manner he pleases, and he has for our sake procured an innumerable croud of manifest proofs, *a cloud of witnesses*, to convince us of his having chosen this method. Things being so, what does it avail us to
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listen to difficulties, and reply to objections started about the communication of the light of the sun, or on the manifestation of the light of spirits? Experience and matters of fact render both these points certain, though reason is equally swallowed up in either.

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Such a man as Bayle would have proved to any benevolent listener, that the sight of terrestrial objects was impossible: but they would have let him talk on, and not a whit less have made use of the spectacle of nature, because arguments must yield to experience. It is the same thing with the clouds wherewith this rash logick-chopper has every where made it his business to darken the excellency of reason, of good manners, and of all religion. You can never offer to this man or his followers any truth, whether natural or revealed, but they immediately have recourse to logick and controversy. We must see. Let us previously examine. This may be said. We shall ask why so? In short, they find nothing but uncertainty or darkness every where. Nor is it very certain that the sun shines at noon.

Pray, tell me, most profound metaphysicians, who will admit of nothing but what your own reason has evidently conceived, and who think that your understanding intitles you to controul the universe; what is the particular destination of those legs God has given you? Probably they are to carry your body where-ever you have a mind to remove. Pray don't you hesitate upon this point. We do you the honour of thinking, that you will not contest this appointment of your legs. You then go by the help of them, and they convey you from your apartment into your garden. Come, set out: get to the top of the Alps, and repair to the coast of Venice. Pass, if you will, the river Don. Tra-
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verse all Asia. Now you have reached the coasts of China. But, what hinders you thence to go as far as the southern continent, and even to proceed so as at last to get into the moon, or into the planet Jupiter? There is no conveyance thither, you say, and your legs are of use only on the earth. But you who are greater philosophers than travellers, you very well know the right use of your legs, and yet are ignorant of the use of your reason. God informs you of truths which are matters of fact. Of these truths he assures and convinces you by means of your senses, or by sufficient testimonies. To this revelation he adds a reason which enables you to make an excellent use of these truths. But you take it into your head to apply your reason to the discussing and contesting them, to disputing against God himself, and to disposing his works according to your own desires. How great is your mistake! Your reason, as well as your legs, was to be exercised upon the earth. There it may regulate your works. It helps you to make a right use of every thing: it has even the glorious prerogative of every where discerning the wisdom of the Author of the universe, and of being able to give him praise. But neither will your legs carry you into the heavens, nor your reason inform you what God ought or ought not to have done. It was enough for you to know what he has done, to be contented therewith, to adore him, and quietly to persevere in the practice of virtue, without ambitiously attempting to submit every thing to your own judgment. You then have run away with discussions superior to your capacity. Your most profound researches are absences that approach to extravagance; and the reason of the humble peasant, who cultivates his field with simplicity,

plicity, has been incomparably better employed than yours. *The result of the HISTORY of the HEAVEN.*

But instead of referring to plain experience men accustomed to an intemperance of judgment, let us apply to such as see the bottom and composition of things nearest at hand. For instance; let me ask Beker or Stalh *, whether they know what the principles and intimate structure of a pear or an apple are. Doubtless we know it, they will say, and we alone have a right to speak of it. It little becomes people who never saw stoves or decompositions to pretend to assign bounds to our knowledge. As for us, we have a privilege to decide upon the ground of beings, the transmutability of metals, and the true contexture of an apple or a pear. We are informed of these things by the analysis. ** Two of the most famous chymists among the moderns.*

Analysis! We are indeed much the wiser for this great word. I believe that analysis shews you a greater or less quantity of certain elements in every fruit. But the particular structure of each kind of fruit, and the bond of the principles in every one, escape your sight. The most ingenious among your brothers agree, that very often the principles of an excellent fruit are not different from those of a poisonous one in the analysis. But your reason, which is already confined within bounds so very narrow with regard to the bond of the principles, remains in absolute darkness when it comes to the principles themselves. What is the water you find? What the iron? What the earth? These three natures to which you arrive in this and all other kinds of fruit, are as unknown to you as that of your own soul, and of the first cause. You see here both what has been granted, and what denied to your reason. The existence and use of things, that is your portion: but the bottom of every

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every thing remains concealed from you. If God has established this order, as you clearly see he has, who are you, to pretend to transgress these bounds, or to complain of the limits he has thought fit to prescribe you? You alchymists cry aloud, that we are much in the wrong thus to set bounds to your knowledge, having never made any operation, or been conversant with furnaces. But we sufficiently know the history of them, and your reproach is most unjust in this place. It is a vague word, as illusory as your promises. The misery in which so many rare secrets and marvellous operations have left you, is a sufficient indication of your ignorance. Nay, in good truth, you are the only persons in whom poverty is unpardonable.

We therefore may very prudently, as to the success of your pretensions, adhere to the frequent acknowledgments of the judicious chymists, who, while they become rich by assemblings and disunitings of tried utility, at the same time agree, that the bottom of bodies is far beyond their capacity; that metals in particular can neither be analysed, nor transmuted, nor destroyed; and that it is intolerable vanity in any man to affirm, that he can produce a mass of gold where there was not a grain, when at the same time the principles of gold are still a secret, and we are even ignorant whether gold has a variety of principles in it or not.

This method of referring every thing to the experience of facts, rather than to the evidence of intimate natures, this maxim of modestly being contented with arguing upon the best use that may be made of what experience incessantly teaches those who consult it, is not a notion which I have framed to myself, nor a rule contrived on purpose
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to charge Gassendus or Descartes with temerity, *The result of the HISTORY of the HEAVEN.* or to blame the conduct of any one else. If all who reason will be pleased sincerely to consult themselves, they may easily perceive that in all the motions either of our heart or hand, we act according to the experience we have had of the excellence of God's works, of his favours, of our faculties, wants, and concerns, and of all the possible uses of whatever is about us, without being able clearly to conceive what God, what a body, a spirit, a muscle, a fibre, or a metal are. Therefore, instead of leading the mind astray, by the promises of a true, certain, and evident knowledge of natural things derived from that of their causes, (a knowledge which men have been hunting after for so many ages) let us rather lead it to a profitable labour, by inviting it to the knowledge of itself, and by acquainting it, that sense and reason have been given to man to try every thing, and to improve whatever is hinted by experience. Such is the principle which we are unavoidably called back to, from the inutility of all the foregoing systems, and an experience ancient as the world itself. Our most laborious and most esteemed naturalists, have all of them no longer any other rule than that of following experience step by step.

So long as the learned have been possessed with any general system upon nature, they have been wholly taken up therewith. Nor did they see any thing in nature, but what they would make immediately to square with their favourite system : and thus busying themselves for ever upon generalities, they contracted an empty kind of learning, wholly consisting of words, and from which society could reap no manner of benefit. But since men, without minding any systems, or even ambitiously seeking after the knowledge of the bottom of any object

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object newly discovered, are contented with knowing the existence and use of it, and its relations to other objects, or to ourselves, it is impossible to number our new-acquired lights, and the helps which have resulted to us from thence.

The first who observed the use that might be made of the pod of scarlet, or of the body of that insect which we call cochineal, or of any other dye, have been contented with the matter of fact, without giving themselves the trouble of reasoning upon the intimate conformation of those matters. Such men are useful naturalists. Copernicus, Galileo, and Cassini, have spied out the motions and phases of the planets, so as to convince themselves that the sun was the common centre of them, and have thereby rendered astronomy more simple and more agreeable to phænomena, without however attempting to tell us how the mass of the earth or the globe of the sun were moved or constructed. These are learned people, indeed deserving our gratitude. Torricellius and Paschal have found out the pressure of the air. Gueric and Boyle have found out its elasticity. Malpighi has unravelled the admirable structure of the plants. Morland has discovered the use of the several parts of flowers; Hooke, Leuwenhoek, and Joblot, the minute animals that live in liquors; Swammerdam and Reaumur, the operations, industry, and services of insects; Ray, Tournefort, La Quintinie, and the Jussieu's, a multitude of new plants, of new remedies, new dyes, new vegetables, and new fruits: I say new, because the use of them was unknown to us. None of them has in the course of his labours thought of Aristotle, of Descartes, or of Newton. None of them has thought of any thing, but of making us certain of some useful matter of fact, without attempting to explain

plain to us what a globule of air, what the texture of a fibre, the wing of a scarabeus, or the balsam of an ananas, were. Our most excellent men in the most celebrated academies are all of them tired with hunting after evidence which flies from them, and are very well satisfied with experience, which seldom fails to crown their labour with success. The publick congratulates them upon the same, and receives their observations with applause; whereas it but very coldly welcomes systematical speculations, whether ancient or modern, because your systematical logician gives us nothing but words, whereas the observer always comes with his hands full.

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It is this almost always successful activity which has caused our modern academies to make more progress and more discoveries in fifty or sixty years, than the schools had formerly done in a thousand.

But these in their turn begin to pursue the same steps. The taste of experiments has from the academies passed into the universities. The most ingenious masters in philosophy every day streighten the limits of uncertain speculations, and of generalities which promise the explanation of every thing, and modestly adhere to what is practical, and matter of fact. They for this purpose have reduced to what is barely necessary all those rules of logick which have never regulated the life of man, not even in the least of his operations. Their logick consists rather of instances of faulty arguments to be avoided, than of needless precepts, to perform what we are taught by nature. Their morals are no longer those of Aristotle, but of the gospel, to which they join the first rudiments of jurisprudence. Their metaphysics are reduced to natural religion, to the necessity of a revelation, and the historical proofs of it, leaving afterwards
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to divines the care of unfolding the progress and extent of the same.

They now-a-days in several places employ two thirds of their course in exercising their pupils in the most useful parts of modern physics; I mean in giving them excellent treatises of geometry and arithmetick, the true principles of mechanicks, an entertaining series of experiments, and the noblest particulars of natural knowledge: things truly important for their certainty, and by the infallible relations they have to piety as well as to the necessities of life, and even (if this be a desirable article) to the embellishment of the mind.

From the choice they have made of so many rich subjects, and from their having banished the chicaneries of the ancient school, we see how seriously these judicious men have reflected upon the importance of their state, and how conscious they have been of the necessity of regulating their method; not indeed upon an old route, or on the extreme commodity it would have been for them to stick to provisions already made, but upon the real advantage of the youth which are to pass out of their hands to the highest posts of the church and state. What a difference between this philosophy and what we were taught thirty years ago! Masters now-a-days lay before youth whatever is capable of exciting their curiosity, and refining their taste. Formerly philosophy was pursued and taught in such a manner, as if men had made it their business to render it ridiculous, and give us a thorough disgust to it.

Too much exactness, or the necessity of application, was not what discouraged us in this philosophy. Nor was our weariness founded on the comparison of these grave questions, with the charms of human learning, which we had just done with ;

with ; since we read with assiduity and the utmost delight the *Grammaire raisonnée*, the art of thinking, the search after truth of Father Malbranche, Paschal's equilibrium of fluids, Pardie's geometry, Pourchot's staticks, and several other books written in a very simple style, and having no other charms but their exactness. These readings were together seated in our minds without confusion, and we discoursed of them with great pleasure. But it was a torture to us when we were to resume our scholasticks, and study hard questions; which, to complete our toil, were of no kind of concern to us when we had attained to the understanding of them. Many of us who had made no inconsiderable figure in the study of the belles lettres, after having made some efforts to maintain their reputation in that of logick, took, some sooner, some later, the resolution of substituting amusing books to this study, or even of giving over all manner of studies. Some did this from a despair of making any progress, imagining these hard and obscure matters to be much superior to their capacity. Others did it from reason, and because it seemed to them, that what they were taught ended in nothing useful or satisfactory. In vain did our masters cry up the importance of syllogistick rules, if we had a mind to be wise the rest of our lives. In vain they extolled the advantage of a general system of physicks explaining all the particular phænomena ; and to no purpose told us, that this was the only means of making the mind exact and extensive. We were not even afraid of hearing people condemn to an eternal want of sense, and of success in publick employments; all such as engaged in them without the logick of the schools. These menaces did not reconcile us to the barbarity of such a study ; and we took advantage of what we heard people say, that

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it was the reading of good books, meditation, and a frequent exercise, that improved the mind more than all the rules; that these had never been of the least help to any in point of practice; that excellent reasoners were every where seen, who knew no more of logick than the bare name: that, on the contrary, those who were the best provided with logick, oftentimes were the poorest logicians in the most common reasonings of life, and above all in their personal conduct; that ladies were often seen, whose genius was of an amazing exactness and penetration, whose whole logick consisted in fine parts, assisted by good reading: that therefore we ought not to be much alarmed at our reluctance for these dry, vexatious studies. It was then a kind of comfort to us, and indeed a secret revenge, to hear men of the greatest merit and experience confess, that all this scholastick jargon, if it did not smother our talents, was neither fit to unfold nor to give them birth; and that the right culture of the mind amounted to the frequenting the company of judicious men, to reading with reflexion, to the making exact analyses or elaborate and frequent abstracts of whatever we read; in short, to the contracting a habit of uttering in a clear and natural manner what we have examined.

Our disgust and these judgments were strengthened by the perpetual jokes we heard people every where making of the strange questions we were exercised upon, and of the tiresome method by which the whole was pursued. When we had out of obedience left the search after truth, or our elements of geometry, or the sphere of Coronelli, and had at length gone through our publick disputes, it very commonly happened, that we were asked a thousand questions upon the subject-matter of our debates.

debates. Ladies educated in the school of the world (the best indeed of all schools) sometimes asked us, What it was had procured us so much applause? and what had been the subject of our disputes? which, they were told, had been carried on very warmly. We replied, that we had been examining,

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Whether philosophy, taken in a collective or a distributive manner, dwells in the understanding, or in the will?

Whether being is univocal with regard to the substance and the accident?

Whether the special dogmatick logick is distinguished from the habitual and practical?

Whether it can be proved, that there are about us bodies truly existing?

Whether the second matter or sensible element is in a mixt act?

Whether there is in the corruption of the mixt a resolution into the primitive matter?

Whether every virtue is causaliter or formaliter a medium between an act that is bad from excess, and an act bad from defect?

Whether the number of the vices is parallel to the double of that of the virtues?

Whether there are not between beings transcendental relations, independent of our thoughts?

Whether the relation of the father to his son terminates in that son considered absolutely, or in that son again considered relatively?

Whether the end moves according to its real or its intentional being?

Whether the abstract and the concrete, syncategorically speaking, do Lord ha' mercy! cried these ladies; what are they puzzling your brains about? Is it really to live among men, or to converse with the inhabitants of the moon, that

you are exercised upon these questions? We expected to hear from you how sugar is made; Whence and how we get cotton; What the origine of pearls and precious stones is; What the supply of fountains and rivers, or any other such thing that concerns us. But you are never with us in whatever we hear you say. Whenever inquiries are made about this philosophy, your answers are still like dreams, and we seem to be in the country of the Great Mogul. It is a strange thing that thirty and forty years should be necessary to form an useless philosopher, and fifteen years be sufficient to bring a girl to perfection!

These ladies would have been far more scandalized, had they known not only the inutility and the ridicule of these questions, but also the singularity of the proofs and distinctions which made up the sorry complement of them. Thus, without the least notion of what passes in society, of what supplies men with food, lodging, furniture, cloaths, or exercise, we were obliged to keep a stupid silence in conversations: or whenever we let the least of the questions that employed our thoughts slip out of our mouths, we were immediately desired to return to Lapland, as inhabitants of another world.

This general contempt of our studies was indeed very well grounded. For though the majority of mankind frame to themselves wrong notions concerning gaming, publick shews, and the things that help to entertain them; yet they never mistake the nature of useful works, and even very well like that you should mention these to them. Speak to them of commerce, for the products of a country, of the methods of relieving the misery of country-people by the encouragement of husbandry, by invivening commerce, and procuring the consump-
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ption of commodities : speak to them of the culture of plants, of a new machine, of the interests of two neighbouring nations ; in short, mention such things as may be justified from experience, then every ear will be open ; and it must be confessed, that the people of the world judge incomparably better of what we ought to busy ourselves about, than our ancient masters of philosophy, who were people living by themselves, and whose learning had no manner of relation to any of the ways of life we might engage in.

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When we complained to them on the crookedness of their scholastick, and of their questions so very foreign to all our wants, or on the very small value generally set upon this kind of learning, they most commonly replied, that it was an useful exercise which subtilized the mind. They were indeed in the right to think, that the study of these questions might give the mind some penetration : but there is no matter whatever which will not produce the same effect, if carefully examined. The study and exercise of jurisprudence is to our magistrates in lieu of logick. I have heard many of our advocates say, that they had never understood any thing in logick, and that their memory alone had in their publick philosophical disputes done the whole business. If logick and the ancient questions have given the understanding of those who pursued them some kind of extensiveness ; it is upon no account because they were therein taught any rules of reasoning, but purely because the understanding was exercised thereby : and since exercise is requisite, life being so short, it is much better at first to exercise the understanding, the exactness, and all the talents, as they now-a-days do, upon questions of service and experimental matters. Every one is sensible, that these matters

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suit all conditions ; that young minds will seize them greedily, because they are intelligible ; and that it will be too late for us to attempt the study of them when we are wholly taken up with the more pressing exigencies of that particular state which each of us shall embrace. The truth of this may here be better inculcated by facts, than any further reflexions.

A carpenter, who understood his trade, and was in tolerable circumstances, had given his son a good education, that is, had made him pass through a course of liberal studies and philosophy. We know no other method. Soon after this young man had gone through his publick disputations, and when he was thinking what kind of life to chuse, his father's death suddenly put an end to his deliberations. Many undertakings that had been begun by the father, obliged this young man to apply to a master carpenter, who was a friend to the family, and who understood his business very well, in order to fulfil the engagements his father had contracted. By degrees the young man himself took a liking to work, and followed the profession of his father. But he bethought himself of reducing his art to certain principles, and of subjecting it to a methodical order. He treated the whole in his head as he had seen his masters treat the art of reasoning. He then wrote, and was never at rest till he had made some disciples. He got together a number of journeymen of the trade, and promised them, that, if they would follow him, he would lead them by a new way to the quintessence and greatest perfection of carpentry.

Our new doctor, after a long preamble on mechanicks, which he promised to treat on by genus and species, came to the first question, and very seriously

seriously examined whether there was a principle of force in man. He long discussed the reasons pro and con, and at last enabled his disciples, knowingly, and without any apprehension of mistake, to affirm, that man was capable of a certain degree of strength, and able to communicate motion, for instance, to an ax, or to a stone, if not too great. He was contented with this modest assertion, being persuaded, that, with this small strength multiplied, he might, towards the end of his treatise, come to transporting the largest pieces of rough marble, and to heaving of mountains. He next proceeded to the examination of the place where this force resided; and after many disputations on the brains, the glandula pinealis, the spirits, and the muscles, he, out of œconomy, and for brevity's sake, determined, that the arm was the chief agent, and the instrument of human strength.

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In a third paragraph, (for you would have wondered how well he divided and put his matter in order) the strength residing in the arm gave him occasion to examine all the constituent pieces of the arm, and to make an exact anatomy of it. He discoursed on the nerves, muscles, fibres, and descended to the minutest filaments. He multiplied the lengths of the muscles by their breadths, and the product of these by the sum of the fibres. From one calculation to another he came to determine the strength of each degree of tension; and by means of these determinations, made himself able to fix the strength of percussion. Thus he weighed a cuff, and joining the strength of the fist to the sum of the blow of a hammer, he shewed you the exact weight with which this percussion was in equal proportion. Finally, to sum up his matters, and for the conveniency of the young carpenters, he reduced the whole into algebraick expressions.

Since there were men to wield the ax, never had been a carpenter so deeply learned as this. His master of philosophy, who had been informed of it, had a curiosity to hear him. He examined his method and proofs. There is indeed some truth in what you advance, said the master to him: but, friend; your art is good only in proportion as the teaching habit of it is converted into a practical one. Your young workmen lose their time by thus postponing acts to theory. I then have lost mine, replied our philosophical carpenter, in listening for six months together to your dissertations on the certainty of our knowledge, and the rules of reasoning. I am as sensible of my having an understanding faculty, as I am sure that there is a degree of strength in me. Nor am I more ridiculous for closely examining, whether we can put any thing in motion, than philosophers are in examining for whole weeks together, whether man can make himself certain of knowing any thing; whether he can reasonably be persuaded that he has a body, and that there are other bodies about him. You ridicule my long speculations; because we, without anatomizing the arm; or calculating the percussion, naturally, and by the help of bare exercise, lift up our hand, strike, and learn how to take aim with our hammer. And pray, Sir, why should we not say the same thing of the art of reasoning? It is still more natural to us to reason than to strike; and if I am in the wrong to teach in what manner the hand performs its operations, you, of course, had done me a vast service in teaching me particular things; in informing me, for instance, how to distinguish the properties of a piece of beech from those of a piece of ash; what wood is fit for the cart-wright, and what for the joiner, rather than to teach me how to reason by
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the anatomy of the faculties of the mind, or by the rules of the universal and particular propositions. I at first thought, that the best thing I could do in mechanicks, was to proceed therein just as you do in the art of reasoning. But I frankly own, that I began to be tired with the tediousness of my own method ; and I would presume, my dear master, to advise you to renounce yours.

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Knowing and acting, reasoning or striking, are faculties existing in us without our participation. They are bounties of the Creator. Experience, exercise, and our own reflexions, rather than any rules, teach us how to reason well, and to strike a blow. I have read Aristotle's categories, Barbay's logick, and other tiresome books on the same subject. All these readings perhaps are fitter to form a good reasoner than a good carpenter. But if reasoning is improved thereby, it is barely because these readings are an exercise of the mind, not because they teach us the nature of it, or the rules of its operations. Therefore a well digested treatise on carpentry would as usefully exercise the mind as the rules of logick, and be something less tiresome than treatises on the operations of our understanding. I now see it very plain : all consists in experience. The ground of sciences is in us ; exercise employs and improves it more or less ; or otherwise, should the study of the pieces and faculties of our mind alone form a good reasoner, it might very well be said, that the study of the making, or the knowledge of the inward structure of an organ, will of itself form a good organist.

Our philosopher, whose method was to have always his lance couched against every challenger, did not remain without a reply. But while our two champions were together by the ears, their disciples, who understood nothing of these ques-
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tions, and who did not like their being still so far from the beginnings of carpentry, took a resolution to file off one after another, and to go and look for a master that might, by repeated examples, and constant practice, teach them how to make a mortise and a tenon.

Of all those who have a right discernment, and noble views, there is none but what looks with pleasure on the vast difference between the choice of the matters formerly treated on, and those now-a-days made the subjects of philosophy. This first step of our professors, at the same time that it shews us their true love for publick good, authorizes us to think, that if there was a method of treating philosophical matters in every respect more advantageous than the ancient, they would think it a pleasure, and even a duty, to follow it, the change of method not being able to stop such as have changed the very nature of the questions themselves.

As I have undertaken this small work with no other view but to assist the studies of youth in philosophy, as well as in human learning, I cannot easily avoid relating, at least historically, what I hear people say both for and against the scholastick method, and leaving the judgment of it to the reader.

It often happens, that the chiefs of families, who are most experienced in point of business, and even those who have made the greatest progress in point of science, express an eager desire of seeing the scholastick form of our studies converted into agreeable conferences, wherein young people might explain themselves in their mother-tongue, in presence of those who are concerned in their education, and might give the publick an account of their studies no way equivocal. When obliged

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to speak upon chosen matters, and especially upon such as are sensible and exposed to every eye, as for instance, upon all the parts of natural history, they would render military persons, ladies, and those whom their condition most keeps at a distance from sciences, capable of judging of their progress. Instead of speaking in bald Latin, fitter to spoil their taste, than to lead them to the understanding of good authors, (the chief aim of ancient languages) they would learn fluently and nobly to speak their own tongue, in which they often are as barbarous as in Latin itself. Nay, what should hinder their being made fit to explain themselves either in Latin or in French, as the company should please, provided they did it in an easy way, without disputes, and in a good Latin style? But it must be owned, that by treating philosophy in French, they would be freed from two uneasinesses, which make a multitude of young people averse to these exercises, and which almost intirely disfigure the natural gracefulness of those who dare to venture upon them. One of these uneasinesses is, their being obliged to cope with all comers, while they feel themselves but lightly armed. They sometimes are sheltered from this danger, by a means that makes neither learned nor courageous men. The other apprehension which disconcerts them still more, is their being obliged to reply in Latin to whatever may be objected to them, by answers which they have not always learned by heart. In these cases, you see their mind lost in John Despauterius, in the technical verses of Port-Royal, or hanging on some rule of their old accidence. They often want a word, or use it in a wrong place. They blush at the mistake, and the whole philosophy is out of joint. Were young people eased of this burden,

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instead of ten or twelve that pursue a course of philosophy, you would find fifty whose genius would gradually display itself, and who were stopped in their progress by no other obstacle but that of a language, of which they neither perceived the delicacy, nor even the construction.

It would be an easy matter to see whether they have wit borrowed, or parts of their own, by trying them upon the major part of the subjects they should have engaged in; and, in order not to neglect the advantage of exact distinction, it might be proper, after having given them a particular enumeration of what may be an objection against their sentiment, to reduce the whole into a single syllogism, that they might be prompted to insist in their reply upon what should appear to them either trifling, or contrary to principles or experience. After which, as is done in all liberal conversations, every body satisfied with having given his opinion, would change the topick, without insisting any further.

The illustrious members who compose our modern academies, learned as they are, would doubtless shew less ardour and satisfaction in the discharge of their functions, if they were by custom obliged in their conferences to speak another language than their own. Ay! why should not a real obstacle to the advancement of sciences among men full grown and truly learned, be a much greater incumbrance to youth? It is then a mere notion thus to look upon this scholastick Latin as having something of learning in it, while it lays a constraint on young people to no manner of purpose, and is really more worthy to be proscribed than regretted.

These complaints, and many others daily dropt against the ancient way of proceeding in philosophy

phy by syllogisms and instances, and in a language foreign both to him who speaks and those who listen, are opposed by reasons very worthy to be heard.

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This ancient usage of disputing in Latin, and by way of argumentation, one may reply, is upon no account a bad practice. The intention of it has evidently been to prevent excursions in speech, and to accustom the mind to a close way of reasoning. Very likely it will always be in the power of masters to give this Latin an easy turn, and to preserve a good taste together with the infinitely profitable use of the Latin tongue.

Besides, the philosophy of the schools is in a manner the nursery of our divines, lawyers, and physicians. So long as the exercises of the highest sciences shall be carried on in Latin, and by way of argument, there is a kind of necessity that this method should be taught in a course of philosophy.

But, without disordering what is already established, one might sometimes save a fourth part of the duration of an exercise, to accustom youth for that time to treat questions as they are treated in the pulpit, at the bar, and in conversation; to make a delicate taste, an easy air, and a good grace, always go hand in hand with philosophy; and especially to set forth in their mother-tongue, without the least confusion, or any great effort of memory, such subjects as have no names or proper turns to be expressed by in Latin. Such is for instance all our modern commerce; a matter so rich, so various, and so very fit to form the mind by the knowledge of the origine and make of whatever we apply to our use. Such is almost all natural history, in which the ancients have not by much been instructed sufficiently to supply us with
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the Latin terms of all its individual parts. Such are metallurgy, dying, and in general all arts and handicraft-trades, which may, as well as natural history, be the matter of the most amusing and most instructive conferences. Such are the mechanicks, modern inventions, and most of our physical experiments; all objects so very important to any assembly, so engaging for young people, but whose exposition would become vastly insipid in Latin, either from constraint, or from our little use of a tongue not natural to us.

In the last place, those who teach now-a-days, have not introduced the scholastick method; and it is no small undertaking to strike at an ancient custom. But it seems, that, by the medium now proposed, one might reconcile all sorts of utility, retain an exercise of much exactness with the ancient method, and by this agreeable alternation of matter and language, prevent disgusts, which are almost unavoidable. It is an easy matter to demonstrate to young people, that they are in the wrong to grow tired of a serious study: but the business is to prevent their taking a disgust at it.

Conclu-
sion.

I thought, my dear reader, that these observations on the best method of regulating our studies, might be placed naturally enough at the close of the account I have given you of the errors of mankind, as I have undertaken this inquiry into the origine of the false opinions and systems from age to age contrived upon nature, with no other view, but, to the best of my power, to render the study of the belles lettres more solid, from the knowledge of what has filled the noble works of the ancients with so many absurd notions, and to render the study of philosophy more useful, by the knowledge of the true compass of our reason.

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You possibly may, after having acknowledged the simplicity and fruitfulness of the principle to which I ascribe the origine of idolatry and of its consequences, still have reason to complain, that the application I have made of it to such or such a deity or opinion, is not equally plausible. But this small essay, at least, may give occasion to some others of handling the same subject with greater skill and judgment, and of introducing a greater connexion between pieces so very unfit for sortment. Time and new researches may improve these first sketches. I entertain some hopes of having at least given you a glimpse of truth. But if this rich matter should one day or other happen to be unravelled by a better hand, and the labour of another rectify or put the finishing stroke to what I have begun, far from being jealous, I shall be very grateful for it, as my only desire is your service.

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I dare flatter myself moreover, that far from reproaching me, as if I had degraded human reason, by reducing it to the trial and discreet use of what it learns from sense, you will, on the contrary, kindly approve of my having powerfully encouraged it, by making it acquainted with its real capacity, and by shewing it a domain truly honourable, in which God supplies it with so many branches of knowledge to be acquired, and a multitude of good actions to be done.

I hope I have convinced you, that it is an alternative every way deplorable, either to dishonour reason by discouragement, as the Pyrrhonians do, who think it incapable of any thing whatever, though it may perform wonders; or by presumption to rate it much above its real value, as do the Cartesians, and many other philosophers, by supposing it capable of such a degree of penetration,
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and of such a measure of evidence, as were never granted it by the Creator.

It is now in your power to decide whether you will do well in your researches to imbrace the structure of the heaven, and of the whole universe; of which God has kept the management to himself, or be contented in your studies with pursuing the knowledge of what God has made subservient to your use. The choice is easily made. The best we can do, is to regulate our studies according to our destination. Now it is demonstrably true, that God, who has given man a measure of understanding proportioned to his wants and his end, has purposed to make him; not a creator, but a husbandman. Such is our condition. In this we may make ourselves eminent, but ought never to go out of it. This title, 'tis true, suits neither the metaphysician, who is always for over-straining, and travelling in his possible worlds, nor the systematical philosopher, who is for ever taken up with some imaginary edifice. These men are no husbandmen, as they are not of this world. But our truly learned, and all those solid genii, whose labour produces some good upon earth, properly speaking; are so many husbandmen. This is a title equally suitable to the industrious trader, the intendant of the navy, the overseer of the commerce, and the learned academick. They, better than any, know the excellence of this function; and the full purport of this word. The more serviceable their learning is, the more are we obliged to them for the share they take in the culture and embellishment of the earth. The geometer, 'tis true, never plowed a field in his life; but he fixes the limits of it. The botanist never handles a spade; but he enriches gardens. The geographer transports neither leather nor corn; but he facilitates
navi-

navigation and trade. The astronomer does not guide the plough ; but he, by the observation of the course of the heavens, regulates husbandry, and the whole body of society. Let us reduce all arts and true sciences to the same point. The thing is easy to be done. *Cod gave man senses and an understanding to improve every thing upon the earth (a), and to give him praise for the same (b).* To this point it is, that experience, common sense, conscience, Moses, and all the Holy Scriptures, refer us ; and from this point all your great systems of physicks seem to have laboured to make us swerve, by raising us so high as to put us out of our sphere, and by busying us about what we can neither understand nor make any use of.

Philosophy will then become amiable, accessible to every one, satisfactory and profitable, in proportion as philosophers, taking the extent of the human understanding for their rule, will renounce all learned pageantry, empty speculations, pretended profundities, and above all the illusory maxim of never admitting any thing but what we evidently conceive, invariably to stick to the knowledge of facts, or the evidence of outward objects, of usages, and relations. The natural consequence of the comparison which we have made of the thoughts of both the ancients and the moderns concerning the origine and design of all things, with what Moses tells us of the same, is, that **NOT ONLY IN POINT OF RELIGION, BUT ALSO IN NATURAL PHILOSOPHY, WE OUGHT TO BE CONTENTED WITH THE CERTAINTY OF EXPERIENCE, AND THE SIMPLICITY OF REVELATION.**

(a) *Ut operaretur terram.*

(b) *In omnibus gratias agens.*

F I N I S.

ILLUSTRATION

CONCERNING

The Egyptian Plants.

I Have with some care collected the texts of the ancient and modern authors, who have spoken of the plants peculiar to Egypt. You have here the quotations and substance of them, not the texts themselves, which would have swelled this small work too much.

See *Herodot. Euterp. num. 54.*

Strab. Geogr. l. 17.

Diod. Sicul. l. 1. pag. 30. Hannov. Wechel.

Theophrast. l. 4. Athenæ. l. 3. c. 1.

Plin. hist. nat. l. 13. c. 17. Idem, l. 18.

c. 12.

Prosper. Alpin. de plant. Ægypt. cum notis Vesling.

Salmasii Plin. exercitation. in Solin.

Pauli Hermanni Paradis. Batav. p. 205. at the word Nelumbo.

Hort. Malabar. Vol. II. p. 59, and follow. at the word Tamara.

Dapper's Egypt ; that of Mr. De Maillet.

An extract of the manuscript memoirs of Mr. Lippi a botanist, one of the attendants of Mr. du

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Roule ambassador in Ethiopia. Which extract was communicated to me by Mr. Bernard de Jussieu, and is perfectly agreeable to the account given the same Mr. de Jussieu by Mr. Van Dermonde, doctor and professor of physick in the faculty of Paris, concerning the use made at Quanton and Macao of the flower extracted out of the root of the Nelumbo.

The result of their several descriptions is this : Egypt had five or six plants peculiar to it.

1. A kind of Rush, the bark of which they in time learned to make ropes, cloth, and paper of. We cannot be sure of finding this plant in the Egyptian monuments, because the use of it was not known towards the beginning of the symbolical writing. Possibly there is a foundation for taking certain very slender switches, which are found commonly enough in the Egyptian monuments, for the stems of this Rush, the middle membrane of which is called *Biblos* and *Papyrus*.

2. The second plant of a more ordinary use in Egypt is the Lote-tree ; a kind of Nenuphar, that grows in the water of the overflowing Nile. The stalk of it rises up to the surface of the water. It is attended with several other stems, and with leaves that remain rolled up like a cornet of paper, till they unfold, and get into the air. The root is eatable. The flower of this Lotus is white : it opens at sun-rising, and shuts in the evening. A small head or pod, of the form of a poppy-head, comes out of it, and contains a seed much like millet. The Egyptians pulled off these heads, dried and fetched the seeds out of them to make bread with.

3. They had another kind of Lotus, which they set a greater value on. The stems, the leaves rolled up like cornets, the unfolding of the leaves and flowers, were pretty much like what we said of the

the first kind. The things peculiar to these plants were these: Its flowers were of a rose-colour, or of carnation, smelled sweet, and were most commonly used to crown people with at feasts. The stalks and leaves rose much above the surface of the water; so that one might, under the shade of this forest, take a walk in gondola's on the water of the Nile. From the heart of the flower arose a small pod like a little inverted bell, or like the comb of the wasps. This bell was called the *cup* or *pyx*, and contained above thirty large grains of the form of small beans, which, whether dried or green, were good to eat. The small cups, when emptied of their seeds or fruit, served to drink out of. They made other vessels with the leaves dried, and neatly curved or twisted. The root of this plant was excellent food. The plant *Nelumbo* found in the island of Ceylon, in the Indies, and in China, has all the same properties. They pulverize the root of it to make bread of. The Chinese raise it in earthen vases full of water, to have the flower of it; and it can hardly be doubted but this is the Lotus, the cornets, flowers, and bells of which we find above or under the Egyptian figures. When the cornets of the leaves are rolled to a point, you see them coming out of the small vase set over the head of the figure. The leaves expanded are often set upon a throne, which seems to have a relation to the sun; and the fruit or the flower shut serves sometimes as a support to the figure of Osiris, sometimes as its head-dress, and sometimes that of others. The same plant, besides the names of Lotus, of Pyx, and of Egyptian bean, has still another, which we shall immediately account for.

In the fourth place, they cultivated in Egypt a plant which had been brought thither from Arabia,
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and which was called *Colchas*, or *Colocasia*. It was a bulbous plant, whose root was an onion good to eat. From it sprung (but in Egypt very seldom) a flower of the form of the cornet of Arum, long, and extended like the ear of an ass, from the middle of which the fruit afterwards put out. This flower is sometimes found upon the Egyptian monuments. It is found upon a figure of Harpocrates, mentioned by Mr. Cupper. But this is not the ancient and ordinary *Colocasia*, so often mentioned by the heathen authors. The *Colocasia* produced flowers commonly used at feasts, and fruit which, as well as the root itself of the plant, was the ordinary food of the people; which cannot be said of the *Colchas* just mentioned, since this plant displays its flowers but very seldom in Egypt, and of course afforded no fruit. All ancient authors agree in successively giving the fruit of the *Colocasia* the names of Lotus, of Pyx, and of the Egyptian bean; so that what at first sight appears to breed a confusion, in reality becomes a very palpable clearing of the matter; nor is it possible to doubt but the Egyptian *Colocasia* and the Indian *Nelumbo* are the second kind of Lotus with a carnation-flower.

The fifth kind of plant peculiar to Egypt is the *Persea*, which many authors and translators have, without foundation, confounded with the peach-tree (*Persica*). It is a fine tree, ever-green, whose leaves resemble those of the laurel, and have an aromattick smell. The fruit, which is like a pear, is good to eat; and has in it a stone resembling a heart. You see two *Persea*-leaves and two cornets of *Colocasia* near the Cancer, which, together with a large circle, covers the head of the Isis in the middle of the Menfa Isiaca.

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The sixth plant known at all times in Egypt, is the *Banane-tree*, or the *Musa*, the description of which I shall not repeat.

These were the foliages which commonly accompanied the symbolical circle found every where over the heads of the Egyptian figures. This circle signified God, and served to fix what related to religion. The circle, whether radiant or simple, has out of flattery been attributed to the eastern kings. It is the origine of their crown. They before that time wore only a diadem, that is, a royal wreath. The solar circle, a magnificent and harmless symbol of what belongs to God, or of what bears the character of him, visibly is the origine of the limbo, or of that small circle called glory, which has unto our days been preserved over or round the heads of the figures representing men eminent for sanctity.

But what could be the relation of the foliages put round the limbo, with God? They perhaps did not signify, as we have presumed, the several divine attributes. But the sight of the circle being intended to rouse the thought of God, and to publish a feast, the several foliages, and their different progresses, might very well intimate to the people what they were to request from God in every season, the circumstance of which they had characterized.

Thence probably proceeds the custom universally practised among the ancient Heathens, of joining a certain foliage to such or such figure, and of attributing to each god a certain preference for one plant more than any other.

The uncertainty we are in as to the exact signification of these foliages, does not impair the exactness of the principle of the symbols. It cannot be doubted but Osiris relates to the sun; Isis to
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the earth, and to the feast of each season ; Horus to the annual works ; and Anubis to the dog-star. The principal figures being significant, the others are so of course, be the individual meaning of them ever so uncertain.

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- Alchymy. Its origine, 40.
- Alchymists and Chymists. Their difference, 60.
- Alchymists (principles of the), 62. False splendor of their principles, 64. Their affected obscurity, 66. Vanity of their promises, 132, *and follow*.
- Anaxagoras (the world of). Extreme absurdity of this system, 115, 116, *and* 117.
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All these figures are extracted from the monuments of Antiquity.

Those which are found in Dom Bernard de Montfaucon's antiquity explained, have been marked with an M. Those taken from *le imagini de i Dei de gli antichi*, which Vincenzo Cartari has collected from Pausanias especially, &c. have been marked with a C. Those which are upon the agate-cup at St. Denis, have been marked with a V. Those taken out of the Mensa Isiaca, given to the publick by Pignorius, are marked with a T.



